

## Submission L001 (Ken Hooper, Bakersfield High School Archives, October 19, 2012)

October 18, 2012

California High-Speed Rail Authority  
770 L Street, Suite 800  
Sacramento, CA 95814

To Whom It May Concern,

For one hundred and eighteen years, families have desired to have their high school aged children educated at Bakersfield High School. They have always carried the Driller pride, whether in the cockpit of B-17 over Europe during World War II, standing in front of a classroom in Mali in the 1980s, or sitting in the United States Supreme Court as Chief Justice in the 1950s. Our business is transforming young adults, and over the last one hundred and eighteen years, business has been good. The history of the school site is not simply the history of the buildings, but the history of students who entered the buildings to become the leaders in our community, state, nation and world. The High Speed Rail project threatens the traditions and mission of the oldest high school in the county that has produced such leaders as governor of California and a Chief Justice of the United States Supreme Court, a Tuskegee Airman, renown poets, Olympic medalists, Hall of Fame Athletes, a Director of NASA, directors of corporations, and other leaders that have been the hearthstone of our community since 1893.

Bakersfield High School has been in the same footprint since 1895. The 1952 earthquake altered the architectural design of the school, but the decision was made in 1952 to remain at the current location. The Kern High School District Board of Trustees and Junior College Board could have chosen to abandon the current site and begin on a new campus in the open land west of Oak Street. But by 1952 the traditions and history of the school were deeply embedded into the community.

The construction plan for the campus in the early 1920s is master plan conceived and carried out by Charles Biggar. Nine of the twelve main buildings on the Bakersfield High School campus in 2011 are designed by Charles Biggar. Post-earthquake 1952 reconstruction was completed with a distinct plan. Principal Hedge detailed this plan in the student newspaper the Blue and White:

Our community did not hesitate in supporting our school after the 1952 earthquake.

The bond was to rebuild the buildings, not to move the school, and the bond passed by an 8-1 majority.

The Blue and White Editorial of February 4, 1953 reflects the student body's response to the generosity of the community.

The principal architects of the school have been associated with each other seamlessly for almost 100 years. Thomas Wiseman was the architect for the Manuel Arts building in 1911. Charles Biggar worked

as an associate for Thomas Wiseman. The architect Charles H. Biggar designed almost every building on the Bakersfield High School campus. He designed buildings from Griffith Stadium, the Science Building, Ludden Hall, the Junior College Building – now Warren Hall, Spindt Hall, to Harvey Auditorium, and even the Water Tower. Much of post-1952 earthquake design work was done by the successor firm to Charles H. Biggar, the firm of Alford & Thomas (C. Barton Alford and W. J. Thomas). The document on the construction of the Castro Lane School in 1948 states:

This is our laymen's proof of the blending of the two firms, even though Charles Biggar had passed away in 1946.

Not only did Charles H. Biggar and C. Barton Alford design and redesign the school, but C. Barton Alford graduated from Kern County Union High School in 1933. The children of Charles H. Biggar, C. Barton Alford and W. J. Thomas graduated from Kern County Union High School and Bakersfield High School.

C. Barton Alford was charged with rehabilitating the campus after the devastating 1952 5.8 earthquake that destroyed so many older schools in Kern County. Alford was one of the earlier modernists in the Southern San Joaquin Valley. Almost all of those early modernists were graduates of USC. The current campus is a national example of the early modernist style of the Mid-1950s created by Bart Alford.

The primary focus of the research conducted after the visit by JRP historical Consulting in April of 2010, has been focused on the history of the buildings. The Bakersfield High School Archives has been assisted by the Bakersfield College Archives, the Kern County Museum, the Beale Library, the Kern County Historical Society, and several individuals. Most importantly Architectural Historian John Edward Powell. The draft of the Environmental Impact Report for Bakersfield High School does not begin to scratch the surface or accurately reflect the history of our buildings, the culture of our school, or the danger the High Speed Rail poses to our student's safety.

Some points regarding our school history:

? Kern County High School, Kern County Union High School, Bakersfield High School, Bakersfield High School, and Bakersfield College were intertwined. This is even more apparent after the 1952 earthquake when one wing of the Junior College Building was closed and the college students and the night school students began taking classes along side the high school students. This melding of the campus that will last for several years.

? The EIR does not effectively reflect that the history of Bakersfield High School is also the history of Bakersfield College and the Bakersfield Adult School. For that is exactly how the people of Kern County have always viewed the campus.

? The Science Building, Ludden Hall, and the two Spindt Halls were retrofitted in response to the Field Act of 1933 and a district bond passed in 1960. The method to this transformation is important in understanding the school. The superintendent of the Kern High School District and the Junior College

L001-1

## Submission L001 (Ken Hooper, Bakersfield High School Archives, October 19, 2012) - Continued

Board did not make the changes from brick sidings to reinforced concrete on a whim. It was made in response to Field Act of 1933 and to ensure the safety of the students.

? The Water Tower is the icon of the campus and home football games – to dismiss it as a simple utilitarian and antiquated structure would be to dismiss the significance of Bakersfield High School's history in general.

? Charles Biggar built the Standard Middle School Auditorium, the Horace Mann Elementary School Auditorium, the Taft High School Auditorium, the East High School Auditorium, but his crown jewel was the \$12.5 million Harvey Auditorium completed two years after his death. While the draft EIR states that Harvey Auditorium is eligible the National Register of Historic Places, placing a six-story railroad trestle adjacent to our performing arts building is outrageous.

? Charles Biggar use of reinforced concrete for the construction of "earthquake proof" buildings was in response to the Long Beach earthquake of 1933.

? The original Commercial Building was constructed in 1895. Students today cross Elm Grove in the shade of giant palm trees planted in 1895. This is one of many ways the history and culture of the 19th century is shared with the students of the 21st century.

? The engineering of the North IT Building construction is connected to the completion and engineering that is used in the construction of Harvey Auditorium. One building cannot be built without the other being constructed first.

? The initial proposal for the North IT Building has the construction to be funded by PWA money, but when the district bond failed in 1939, the PWA withdrew the money from the district. The superintendent ordered the completion of the building regardless. Subsequently the North IT Building's PWA number is 1724, but no PWA money was used in its construction. More importantly only local money was used in its construction.

? Harvey Auditorium is the dream of Trustee Judge Harvey. He was president of the Kern High School District and Junior College School Board for almost 20 years. He advocated for a first-class auditorium for the community as early as 1934. He always believed the students of Bakersfield High School and Bakersfield Junior College should have priority and preference to community at large for scheduling purposes. This attitude is policy today. Judge Harvey saw the opening performance in the Auditorium on a Tuesday; he died on the subsequent Friday.

? There are three structures alumni become emotional over when discussing their tenure on campus, Harvey Auditorium, Griffith Stadium, and the Water Tower.

? Chief Justice Earl Warren graduated in 1908. He visited the campus Kern County Union High School and Bakersfield High School on a regular basis. He visited as California State Attorney General in

November of 1941, Governor of California in 1948 at the retirement of Coach Goldie Griffith. As Chief Justice in 1956, Earl Warren came with his mother for the dedication of Warren Hall. And he attended the 50th Anniversary Class reunion in 1958.

? Alumni Frank Gifford has also been back to Bakersfield High School too many times to list, the last time was in 2008.

? In the reconstruction of Boys and Girls Gym of Bakersfield High School, the solid timber lamella roof was cutting edge at its construction in 1955. The 1954 edition of 'Modern Timber Engineering' by Scofield O'Brien (published by the Southern Pine Association) has a chapter on lamella roof including drawings and all the engineering calculations. The lamella roof design is now going through a renaissance in the United States with architect preservationists attempting to preserve the last remaining structures.

? The August 20, 1943 Article titled "Students Approved to work at Vega Plant" was in cooperation with the Industrial Arts staff to assist in the wartime production of B-17s. It is a reflection of the new Industrial Arts building's importance during World War II. Defense classes through the Bakersfield High School began at 9:00 pm and ended at 4:30 am. The purpose of these classes was to educate men and women on the use of machinery so they could work in the defense industries of Californian. Kern County's 'Rosie the Riveter' was born at Kern County Union High School.

? Griffith Stadium is not a memorial stadium. The stadium, known affectionately as the 'Rock,' was named for math teacher and head football coach Dwight "Goldie" Griffith. He was head football coach from 1908-1948. In the existence of Bakersfield High School, we have amassed a football record with the most victories of any high school in the state of California.

The draft EIR came out in August of 2011, yet it took a maximum effort and weeks of my own time to find someone who had a copy of the DPR-523 report for Bakersfield High School, an item necessary to respond to the EIR. This has given us only a few weeks to respond to a long and technical document. Contrary to the draft EIR, it is my professional belief that the Bakersfield High School campus is a historic district.

Thank you,

Ken Hooper  
History and Archiving Teacher  
Bakersfield High School Archives

L001-2

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## Response to Submission L001 (Ken Hooper, Bakersfield High School Archives, October 19, 2012)

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### L001-1

Comment noted. The Historic Property Survey Report (HPSR) (Authority and FRA 2011c) includes an evaluation of the Bakersfield High School campus as a potential district. The evaluation concluded that the campus as a whole does not meet the criteria for listing in the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR) because it does not meet the criteria for significance within the broader context of state or county education or the criteria for significance within the context of secondary education within the city, and it has undergone decades of changes that have resulted in a substantial loss of integrity as a district.

Primary and secondary sources were used to document the history of the school and the development of the campus, including material from the Bakersfield High School Archive, historic aerial photography, historic architectural plans, and extensive local and architectural press coverage, among many other sources. The citations and full reference list were provided in the evaluation form, which shows that archival and secondary source research for this project was extensive. The commenter was contacted during the research of the high school. The evaluation and conclusions drawn are thoroughly and adequately documented by the research conducted, as cited.

In February 2012, the California State Historic Preservation Officer (SHPO) concurred with the findings of eligibility and non-eligibility presented in the technical documents prepared for the Draft EIR/EIS (SHPO 2012). Details of the findings are available in the Historic Architectural Survey Report (HASR) and the HPSR (Authority and FRA 2011b, 2011c). The SHPO concurred that Harvey Auditorium is individually eligible for the NRHP. The auditorium is considered a historical resource for the purposes of the California Environmental Quality Act (CEQA). The SHPO also concurred that none of the other buildings or structures on the Bakersfield High School campus qualified for inclusion in the NRHP, either individually or as a cohesive grouping, as required for historic districts. The resources that did not meet the eligibility criteria for listing in the NRHP or CRHR are not considered historical resources under CEQA.

### L001-2

Comment noted. The Historic Property Survey Report (HPSR) (Authority and FRA

### L001-2

2011c) includes an evaluation of the Bakersfield High School campus as a potential district. The evaluation concluded that the campus as a whole does not meet the criteria for listing in the National Register of Historic Places (NRHP) or the California Register of Historical Resources (CRHR) because it does not meet the criteria for significance within the broader context of state or county education or the criteria for significance within the context of secondary education within the city, and it has undergone decades of changes that have resulted in a substantial loss of integrity as a district.

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Submission L002 (Mike McGowan, California State Association of Counties/Yolo County, July 25, 2012)

California State Association of Counties



July 24, 2012

1100 K Street  
Suite 101  
Sacramento  
California  
95814

Mr. Dan Richard  
Chairperson, California High-Speed Rail Authority  
770 L Street, Suite 800  
Sacramento, CA 95814

**Re: Request for Extended Public Comment Period on the Revised Draft EIR/EIS**

Dear Chairperson Richard:

The California State Association of Counties (CSAC) urges the California High-Speed Rail Authority (Authority) to extend the public comment period for the Revised Draft Environmental Impact Report (EIR)/Supplemental Draft Environmental Impact Statement (EIS) for the 114-mile Fresno to Bakersfield Project section.

CSAC appreciates the Authority's recognition that robust public participation is critical to the California High-Speed Rail Project (Project) by providing an extra 15 days for public comment beyond what the state and federal law requires. However, in order for the public to provide meaningful input on a project of such size, scope, and complexity and with such significant impacts to local communities, the traditional 30-45 days of public comment, and even the increased 60-day public comment period, is not sufficient.

According to the Authority, the Revised Draft EIR/EIS includes the environmental analysis and mitigation measures associated with new alignment alternatives and potential station locations west of Hanford, an additional alternative through Bakersfield, and refinements to the existing Fresno to Bakersfield alternative alignments. This new information on alternative alignments and stations will affect a number of California's counties. Potential impacts include the displacement of agricultural, commercial, and industrial business and impacts to air and water quality, hydrology, mineral resources, utilities, service systems, and noise, to name a few. Counties and the local constituents they serve must have adequate time and resources to provide critical feedback about the Project's projected impacts.

CSAC has had a support position for the California High-Speed Rail Project since early 2007. However, given the significant changes to the project over the past year, many counties are concerned about the implementation and mitigation of significant impacts of the Project. As such, robust environmental review and public comment is critical to a successful Project and the ongoing economic and social vitality of our great state.

CSAC thanks you in advance for your consideration of this request. Please do not hesitate to contact DeAnn Baker, CSAC Senior Legislative Representative, at (916) 650-8104 or [dbaker@counties.org](mailto:dbaker@counties.org), should you need any further information about this issue. We look forward to your response and to our continued work with the Authority on implementation and mitigation of California's High-Speed Train.

Sincerely,

Mike McGowan  
President, California State Association of Counties  
Supervisor, Yolo County, California

cc: Jeff Morales, CEO, California High-Speed Rail Authority  
Dennis Trujillo, Chief of External Affairs, California High-Speed Rail Authority  
Gregg Albright, Interim Deputy Director of Planning, California High-Speed Rail Authority

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Response to Submission L002 (Mike McGowan, California State Association of Counties/Yolo County,  
July 25, 2012)

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**L002-1**

Refer to Standard Response FB-Response-GENERAL-07.

Submission L003 (Ting He, California Water Service Company, October 18, 2012)

**Fresno - Bakersfield (July 2012+) - RECORD #311 DETAIL**

**Status :** Action Pending  
**Record Date :** 10/18/2012  
**Response Requested :** No  
**Affiliation Type :** Local Agency  
**Interest As :** Local Agency  
**Submission Date :** 10/18/2012  
**Submission Method :** Website  
**First Name :** Ting  
**Last Name :** He  
**Professional Title :** Manager of Distribution, Engineering  
**Business/Organization :** California Water Service Company  
**Address :**  
**Apt./Suite No. :**  
**City :** San Jose  
**State :** CA  
**Zip Code :** 95112  
**Telephone :** 408-367-8323  
**Email :** the@calwater.com  
**Email Subscription :**  
**Cell Phone :**

**Add to Mailing List :**

**Stakeholder Comments/Issues :** I have reviewed the proposed alignments of the high speed rail in the Fresno -Bakersfield section. The proposed alignments are in conflict with our water facilities in Bakersfield. Both California Water Service Company (Cal Water) and the City of Bakersfield have water facilities in Bakersfield within the proposed high speed rail alignments. Cal Water operates and maintains water facilities for the City of Bakersfield. Please contact Cal Water to resolve utility and right of way conflicts. Thank you.

**EIR/EIS Comment :** Yes  
**Official Comment Period :** Yes

L003-1

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## Response to Submission L003 (Ting He, California Water Service Company, October 18, 2012)

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### L003-1

Refer to Standard Response FB-Response-PU&E-03.

The Authority met with the California Water Service Company on October 4, 2012, to initiate discussions on an agreement to resolve utility conflicts. The Authority will continue to work with the California Water Service Company to enter into an agreement and address utility and right-of-way conflicts between the two entities.

Submission L004 (Anil Mehta, Chinmaya Mission Bakersfield, September 28, 2012)

**Fresno - Bakersfield (July 2012+) - RECORD #214 DETAIL**

**Status :** Action Pending  
**Record Date :** 9/28/2012  
**Response Requested :** No  
**Affiliation Type :** Local Agency  
**Interest As :** Local Agency  
**Submission Date :** 9/28/2012  
**Submission Method :** Website  
**First Name :** Anil  
**Last Name :** Mehta  
**Professional Title :** President  
**Business/Organization :** Chinmaya Mission Bakersfield  
**Address :**  
**Apt./Suite No. :**  
**City :** Bakersfield  
**State :** CA  
**Zip Code :** 93312  
**Telephone :**  
**Email :** anilmehtamd@yahoo.com  
**Email Subscription :** Bakersfield - Palmdale, Fresno - Bakersfield  
**Cell Phone :**  
**Add to Mailing List :** Yes

**Stakeholder  
Comments/Issues :**

Gentlemen:

These are my comments for your new draft EIR/EIS for the Fresno to Bakersfield area.

L004-1

1. The High-Speed Rail plan as it stands is in total violation of Prop 1A. The original amount approved by the voters was \$33 billion. Of this, \$9 billion was to be paid by The State of California. The rest of the money was to come from private investors and from the Federal Government. As we understand, so far there are no private investors that have been publicly identified or named by the authority. The US Government and the Congress have already clearly expressed their inability to send more money to California for the High-Speed Rail project. There is no money in the pipeline after the initial \$3.1 billion that has been sent already to us. In view of the fact that there is no Federal money and no private investors, The State of California will be stuck with the entire bill.

L004-2

2. The original amount approved by the voters was \$33 billion. As per the CHSRA business plan, the amount has risen to \$68 billion. That means, the State of California will have to fund the additional deficit totalling \$65 billion. In this time of financial crisis, I do not see how we can afford to spend the money on this kind of a project. We are already cutting schools, colleges, healthcare, and releasing prisoners early. Hence, increasing the cost without getting additional voted approval is a clear violation of Prop 1A.

L004-3

3. Prop 1A clearly stated that the train should travel from Los Angeles to California in less than 3 hours without any change of trains by the passengers. As per the new business plan, this will be a three-stage process. It would be a slow train in the Los Angeles area, high speed in the valley, and then slow again in the Bay area requiring change of trains. Also, the time will certainly be over 4 to 5 hours. This new business plan does not meet the criteria for Prop 1A.

L004-4

4. Prop 1A clearly states that the entire route should be electrified. As per the present business plan, we are using conventional rail in the Los Angeles area and in the Bay area and we may have electrified trains in the valley.

L004-5

5. Also, the plan as outlined goes through prime farmland and will cause major destruction to our agricultural base. It is not clear how the farmers will be compensated for this, not only the destruction or taking away of the land but also the loss of value of the entire parcel and their inconvenience in getting from one side of their farm to the other.

L004-6

6. As it stands right now, the train is going through the central valley. The I-5 route was not considered adequately by the authority, even though this was recommended by consulting experts from France. Using that route would have been less expensive and would have caused less disruption to the valley.

L004-7

7. The way the route stands right now, it will cause significant damage to Amtrak. The Amtrak trains will be re-routed on the new high-speed rail track until we can get electrification for high-speed rails. That will cause significant economic damage to cities like Wasco and Corcoran which depend on the train station for their economic health.

L004-8

8. The business plan and the EIR/EIS was not adequately conveyed to the citizens of California. The people in the affected area still do not have detailed maps and descriptions of which properties and homes and businesses will be taken. Save Bakersfield Committee has been trying to get a list of homes and businesses that will be affected, but we have not got that from the authority. The authority's information and notification of the affected parties has been inadequate, poor, and not meeting the criteria of NEPA.

9. NEPA also requires that there be input from the affected parties, which has not been obtained by the High-Speed Rail Authority and they are clearly in violation of the Environmental Justice provisions of NEPA.

10. The route going through Bakersfield will cause major disruption to

Submission L004 (Anil Mehta, Chinmaya Mission Bakersfield, September 28, 2012) - Continued

L004-8	<p>the city and to downtown. All the three alternatives passing through Bakersfield are within a few feet of each other. There is no true alternative route that has been identified. Consideration should have been given to having a station outside Bakersfield, near the Airport, making it a Transportation Hub. Then, existing rail lines could have been used to get to Tehachapi. In this also they are in clear violation of all environmental laws.</p>	<b>EIR/EIS Comment :</b> Yes
L004-9	<p>11. Not only this project does not meet NEPA guidelines, but is in clear violation of CEQA. It is for this reason that state Senator Michael Rubio and his cronies have been trying to exempt this process from CEQA. This is clearly an illegal maneuver and is an attempt to shield this project from any environmental challenges.</p>	<b>Official Comment Period :</b> Yes
L004-10	<p>12. The passage of this train through Bakersfield over 90 feet high viaducts will cause major destruction and damage to the City of Bakersfield which could be avoided by choosing an alternative route. The location of the train station will cause very major damage to the downtown area, also causing excessive pollution and traffic which has not been adequately mitigated. Also, it will have major impacts to a lot of our city properties and some of the businesses.</p>	<b>Attachments :</b> 214_Mehta_Website_09282012_Original.pdf (10 kb)
L004-11	<p>13. The EIR does not address the areas east of Oswell Street. We do not know which homes or businesses will be affected and how that route will run. We feel that this EIR is incomplete and inadequate.</p>	
L004-12	<p>14. The information provided to the citizens by the High-Speed Rail Authority is purposely vague and misleading and in technical language. Lots of the material can only be obtained from the web site and only by somebody who has a high-speed internet connection making it inaccessible to a large number of Californians.</p>	
L004-13	<p>15. We do not have adequate information in Spanish. A large number of the citizens who will be affected by this train whose homes and businesses will be destroyed only speak Spanish. Not providing adequate Spanish translation of the EIR/EIS is also a clear violation of NEPA.</p>	
L004-14	<p>16. The City of Bakersfield and The County of Kern have expressed objections to this project in their votes. The comments made by The City of Bakersfield and the county have not been addressed in the new EIR.</p> <p>The Save Bakersfield Committee also had made extensive comments during the first EIR. These comments and suggestions have not been addressed in the new draft EIR.</p>	
L004-15	<p>The noise mitigation measures have not been clearly outlined, and this will create significant economic impact to the citizens of Bakersfield.</p>	
L004-16	<p>For these and many other reasons, we strongly oppose the High-Speed Rail project as outlined right now. We feel that this project should, at this moment, be re-designed and re-studied keeping these points in mind and also the economic health of our state.</p>	
L004-17	<p>It would be much cheaper and beneficial to use the existing Amtrak lines and put higher speed trains which will serve most of the purpose as outlined by the new High-Speed Rail without causing major economic and social hardship to the citizens of California.</p> <p>Thank you for your consideration.</p> <p>Sincerely,</p> <p>Anil Mehta President Chinmaya Mission Bakersfield</p>	

## Response to Submission L004 (Anil Mehta, Chinmaya Mission Bakersfield, September 28, 2012)

### L004-1

Refer to Standard Response FB-Response-GENERAL-17, FB-Response-GENERAL-14.

### L004-2

Refer to Standard Response FB-Response-GENERAL-14.

This comment confuses project phasing with the completed project. The completed project will consist of a fully electrified HST system that achieves the legislated travel time of 2 hours and 40 minutes between Los Angeles and San Francisco. Proposition 1A specifically provides for service to Central Valley cities, so its intent is to provide an HST system with the capacity for both through trains connecting the termini and inter-regional service from the Central Valley to the termini (see Streets and Highways Code Section 2704.04).

### L004-3

Refer to Standard Response FB-Response-GENERAL-04, FB-Response-SO-01, FB-Response-AG-02.

The Authority will pay fair market value for all properties taken. Fair market value takes into account the value of the land, the improvements on the land, as well as the future income the land and improvements could generate.

### L004-4

Refer to Standard Response FB-Response-GENERAL-02.

### L004-5

Refer to Standard Response FB-Response-GENERAL-12, FB-Response-GENERAL-13.

### L004-6

Refer to Standard Response FB-Response-GENERAL-16, FB-Response-SO-01.

The 2012 Business Plan (and previous business plans) are available on the Authority website.

### L004-6

Alignment plans and maps of parcels directly affected by the project, where the whole parcel or a portion thereof would be acquired by the project, are provided in Volume III of the Revised DEIR/Supplemental DEIS.

### L004-7

Refer to Standard Response FB-Response-GENERAL-16, FB-Response-SO-07.

### L004-8

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-25.

The procedural requirements for NEPA and CEQA were followed during the environmental review of the Fresno to Bakersfield HST Section.

The Authority and the FRA's prior program EIR/EIS documents (see Section 1.5, Tiering of Program EIR/EIS Documents) selected the BNSF Railway route as the preferred alternative for the Central Valley HST between Fresno and Bakersfield in the 2005 Statewide Program EIR/EIS decision document. Therefore, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF Railway corridor.

As discussed in Section 2.3.1 of the EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project as required under 14 CCR 15126.6 and 40 CFR 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The purpose of project alternatives is to minimize or avoid impacts. For the Fresno to Bakersfield Section of the HST System, alternatives were developed to reduce or avoid impacts associated with the BNSF Alternative. In Bakersfield, the BNSF Alternative would displace six religious facilities, the Bakersfield High School Industrial Arts building, the Mercado Latino Tianguis, and 119 homes in the eastern portion of the city. In contrast to the corresponding segment of the BNSF Alternative, the Bakersfield South Alternative would not affect the Bakersfield High School campus or the Mercado Latino Tianguis. However, the alignment would displace five religious facilities, the Bethel Christian School, and 146 homes in east Bakersfield. The Bakersfield Hybrid Alternative

## Response to Submission L004 (Anil Mehta, Chinmaya Mission Bakersfield, September 28, 2012) - Continued

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### **L004-8**

would not affect the Bakersfield High School campus or the Bethel Christian School; however, the alignment would displace one religious facility, the Mercado Latino Tianguis, the Bakersfield Homeless Shelter, and 57 homes in east Bakersfield.

### **L004-9**

This is one in a series of EIR/EISs that have been and will be prepared for the HST System and its component sections. No attempt has been made by the Authority to avoid its responsibilities under CEQA. The project-level EIR/EIS for the Fresno to Bakersfield Section meets the requirements of CEQA and NEPA. None of the comments provided in this submission contains substantial evidence that the document does not meet CEQA and NEPA requirements.

### **L004-10**

Refer to Standard Response FB-Response-AQ-05, FB-Response-GENERAL-10, FB-Response-GENERAL-25, FB-Response-SO-04, FB-Response-TR-01.

The viaduct structures proposed in Bakersfield vary in height, but none of them exceed 90 feet.

### **L004-11**

Refer to Standard Response FB-Response-GENERAL-20.

### **L004-12**

Refer to Standard Response FB-Response-GENERAL-16.

Environmental documents are written to a specific and legally required standard. Fact sheets, brochures and summaries were provided to ensure widespread understanding of the environmental documents and ease to find pertinent information. Printed copies were placed in the Kern County libraries throughout the Bakersfield area. Internet accessible computers are available at many of the same libraries for use by patrons. Additionally, public workshops were designed to answer and solicit feedback on the documents and to assist the public with finding pertinent information.

### **L004-13**

Refer to Standard Response FB-Response-SO-07.

The Authority's website has provided translated materials and has offered translation services at all public meetings. The Executive Summary and several public educational materials regarding the Draft EIR/EIS and Revised DEIR/Supplemental DEIS are available in Spanish. In addition, notification letters for the Draft EIR/EIS were sent in English and Spanish to residents, property owners, meeting attendees, businesses, organizations, elected officials, cities, counties, and agencies.

### **L004-14**

Some revisions were made in the Revised DEIR/Supplemental DEIS in response to comments received on the Draft EIR/EIS where it was determined to be appropriate. This includes, for example, addition of the Bakersfield Hybrid alternative. Responses to comments received on the Draft EIR/EIS are provided in Volume IV of this Final EIR/EIS.

The responsibilities of the City and County are different from those of the Authority. Pursuant to Proposition 1A and the Authority's enabling legislation, its charge and responsibility is to plan and build an HST system connecting the Bay Area to the Los Angeles Basin (see, for example, Streets and Highways Code Section 2704.04). Further, that system is to serve the Central Valley. Finally, the Record of Decision based on the 2005 Systemwide EIR/EIS calls for building an HST system along the BNSF corridor, with the potential for stations in Fresno and Bakersfield.

### **L004-15**

Refer to Standard Response FB-Response-N&V-05.

### **L004-16**

Refer to Standard Response FB-Response-GENERAL-14.

Your opposition to the project is noted.

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Response to Submission L004 (Anil Mehta, Chinmaya Mission Bakersfield, September 28, 2012) - Continued

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**L004-17**

Refer to Standard Response FB-Response-GENERAL-13.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012)



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October 19, 2012

VIA E-MAIL AND U.S. MAIL

California High-Speed Rail Authority  
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RE: Revised Draft EIR/Supplemental Draft EIS Comment (California High-Speed Train  
Project: Fresno to Bakersfield Section)

To Whom It May Concern:

L005-1

On behalf of the City of Bakersfield (City), I am submitting this letter in response to the Revised Draft Environmental Impact Report/Environmental Impact Statement (RDEIR/EIS) for the Fresno to Bakersfield Section (Section) of the California High-Speed Train Project (Project). The City is a Coordinating Agency under the National Environmental Protection Act (NEPA), 42 U.S.C. section 4321, *et seq.*, and its guidelines, Code of Federal Regulations, title 40, section 15000, *et seq.*, and a Responsible Agency under the California Environmental Quality Act (CEQA), Public Resources Code section 21000, *et seq.*, and its guidelines (CEQA Guidelines), California Code of Regulations, title 14, section 15000, *et seq.* As such, the City takes its responsibility to participate in the environmental review of the Project very seriously.

The California High-Speed Rail Authority (Authority) has provided responsible, trustee and impacted agencies and the interested public very little opportunity to consider and influence the scope of the alternative alignments considered in the RDEIR/EIS and its analysis. When it has solicited feedback from the City and other impacted jurisdictions, businesses and individuals, it appears to have frequently disregarded what those who would be impacted have said, without giving the solicited feedback due consideration.

Unfortunately, the Authority did not adequately consult with the City when it prepared the RDEIR/EIS, as is required under CEQA. (See Pub. Resources Code, § 21092.4 [For all projects of statewide, regional, or area wide significance, lead agencies must consult with public agencies which have transportation facilities that could be affected by the project]; see also CEQA Guidelines, §§ 15086(a)(5), 15206.) If it had so consulted, the analysis may have adequately considered the Section's impacts to the City. Rather than reach out to the City

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when the RDEIR/EIS was being prepared, the Authority provided the City with only the bare minimum notice.

**Although the City has had numerous meetings with the Authority, the Authority has never worked with the City to alter routes or explore alternatives to address impacts on City resources or other public facilities.** Issues brought forward by staff such as the project's significant adverse impacts on BHS, Mercy Hospital, East Bakersfield, the convention center, and current road construction projects were never resolved. The Authority, although invited numerous times to address the Planning Commission and City Council to provide public dialog, never accepted. Instead, the Authority has decided to defer its obligations to consult with the City to the RDEIR/EIS comment and response process rather than have open and honest discussions with stakeholders and the public concerning the project.

The City strenuously objects to this lack of good faith consultation and inadequate notice. The Authority's manner of (1) providing limited notice, (2) soliciting and then disregarding feedback and (3) making empty promises regarding its efforts to minimize impacts through design changes and mitigation has eroded trust among stakeholders and those who will be severely impacted by the Section, including the City. In our communications with other stakeholders and local agency officials affected by this Section and the Merced to Fresno section, we have learned that this is a widespread complaint and the source of significant frustration and distrust.

L005-2

The RDEIR/EIS indicates the Project would have significant construction and operational impacts on residents of the City and surrounding communities. It acknowledges that these impacts would permanently affect the physical environment and quality of life in the region. Unfortunately, the RDEIR/EIS substantially underestimates these impacts.

L005-3

The Authority also failed to provide relevant information, including all supporting technical analysis and reports, to the City and the public in a timely manner. Public Resources Code section 21003.1 requires that information relevant to the significant effects of a project be made available as soon as possible to the general public and other public agencies. Other sections of the CEQA statute and CEQA Guidelines echo this requirement. The disc containing the RDEIR/EIS, which the Authority provided to the City, did not contain all of the information necessary for the City to review the analysis of Section impacts.

L005-4

After careful review of the RDEIR/EIS and the information made available by the Authority in the limited time made available by the Authority, the City has concluded that the RDEIR/EIS fails to fulfill NEPA's and CEQA's fundamental objective of informing the public and the decision makers of the significant environmental effects of the Project and either omits or defers the information and analysis necessary to mitigate the Project's devastating significant impacts. The defects and omissions identified in the City's comments clearly show the RDEIR/EIS fails to comply with the fundamental requirements of NEPA and CEQA.

L005-5

The severe nature and broad extent of the Section's significant environmental effects compelled the City to expend considerable resources in its review of the RDEIR/EIS. During the unreasonably short 90-day comment period provided for reviewing and commenting on the RDEIR/EIS, the City retained experts and directed City staff to evaluate the adequacy and completeness of the RDEIR/EIS. The specific environmental issues identified in comments enclosed as **Supplement A** were prepared by staff from the City's planning, public safety, economic/redevelopment, property management, public works and engineering

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departments, and by experts retained by the City in the fields of traffic and transportation, noise, air quality, and the legal requirements of NEPA and CEQA. The curriculum vitae of these experts, which establish their qualifications, experience and expertise to comment on their respective subjects, are enclosed as Attachment 1. (*Sierra Club v. California Dept. of Forestry & Fire Protection* (2007) 150 Cal.App.4th 370, 382 [comments by qualified experts constitute substantial evidence that EIR is inadequate].) The experience and expertise of the City staff also qualifies their comments to serve as substantial evidence of the numerous ways in which the RDEIR/EIS fails to comply with the procedural and substantive requirements of NEPA and CEQA. (*City of Arcadia v. State Water Resources Control Board* (2006) 135 Cal.App.4th 1392, 1425 [comments of government officials on a project's anticipated environmental impacts on their communities constitutes substantial evidence that EIR is inadequate]; *City of Rancho Cucamonga v. Regional Water Quality Control Board* (2006) 135 Cal.App.4th 1377, 1387 [comments of agency staff constitute substantial evidence].)

As explained more fully below and in the attached Specific Comments by the City (Supplement A), the RDEIR/EIS prepared for the Project does not comply with the requirements of CEQA and NEPA. **In general, the RDEIR/EIS is an inadequate document for (1) describing the Section, (2) analyzing its significant impacts to air quality, noise and energy, among other resources and impact categories, and (3) formulating mitigation measures for Section impacts and developing Section alternatives that could meet project objectives while avoiding or reducing its impacts.** These comments demonstrate that the Authority may not approve the alignment for the Section until an adequate revised EIR/EIS is prepared and is recirculated for public review and comment.

The RDEIR/EIS states that responses to comments previously made to the initial RDEIR/EIS in October 2011 will also be addressed in the Final EIR/EIS. Therefore, we direct your attention to the City's previous comments and request that these comments be addressed in the Final EIR/EIS for the Section included as part of RDEIR/EIS record of proceedings. As more fully explained in the attached specific comments (Supplement A), **the RDEIR/EIS fails to address or respond to many of the substantive comments raised previously by the City.**

L005-6

**GENERAL COMMENTS**

**1. The Initial Period of Time Allowed for Public Review and Comment Was So Unreasonably Short that It Precluded Effective Public and Agency Participation.**

The RDEIR/EIS, including the appendices, reference material and previous environmental documents from which it purportedly tiered, comprised many thousands of pages of material. In the revisions alone, over 900 pages of text and nearly 1,200 pages of maps and drawings have been added to an already voluminous document. Despite the large volume of material and the enormous public interest in the Project and its potential impacts on the environment, the Authority allowed only 90 days for public review and comment. This truncated review period was clearly unreasonable and effectively precluded any meaningful opportunity for informed public and agency participation.

Although the time allowed exhibited facial compliance with CEQA's minimum requirements, it clearly violated the Authority's duty to provide an adequate opportunity for public review and comment and to ensure informed public participation in the environmental review

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process. (Guidelines §§ 15086, 15087, 15201). Numerous concerned persons, including the City, requested that the Authority allow reasonable additional time for public review of the RDEIR/EIS. The failure to allow a reasonable time for public review of such an unusually long and complex RDEIR/EIS denied meaningful participation by interested agencies, organizations and individuals and violated CEQA's most basic objectives.

The unreasonably brief period of time allowed for review of the RDEIR/EIS has prevented the City and others from being able to thoroughly review, digest and comment on much of the information contained in the RDEIR/EIS and its related materials. The City's comments, which include the general comments below and specific comments prepared by the City's experts and staff in Supplement A, necessarily discuss only some of the important environmental issues which have not been adequately addressed in the RDEIR/EIS. Accordingly, the City reserves its right to submit additional comments in the future on the revised RDEIR/EIS, including any and all unrevised portions of the original RDEIR/EIS which it may contain.

L005-7

**2. The RDEIR/EIS Does Not Adequately Tier Off of or Incorporate by Reference the First-Tier Statewide and Bay Area PEIR/EIS Documents.**

The RDEIR/EIS purportedly tiers off of Statewide and Bay Area PEIR/EIS. The RDEIR/EIS does not clearly explain, however, how the original and two revised Bay Area PEIR/EIS document updates or modifies the Statewide PEIR/EIS document, nor does the RDEIR/EIS consistently or clearly explain how its analysis relies upon or differs from these previously prepared documents. With thousands of pages of background analysis to sift through, and thousands of pages of project-level analysis and technical reports to review, the public is left to wonder how this document fits into the overall analytical structure of this complicated and muddled tiering approach.

This attempt at incorporation by reference and tiering fails to satisfy CEQA's requirements. "When an EIR uses tiering or incorporation, it must give the reader a better road map to the information it intends to convey." (*Vineyard Area Citizens*, supra, 40 Cal.4th at p. 443, citing CEQA Guidelines, § 15150, 15153.) The data in an EIR must not only be sufficient in quantity, it must be presented in a manner calculated to adequately inform the public and decision makers, who may not be previously familiar with the details of the project. "[I]nformation 'scattered here and there in EIR appendices,' or a report 'buried in an appendix,' is not a substitute for 'a good faith reasoned analysis....'" (*Id.* at p. 442, quoting *California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219, 1239.) The RDEIR/EIS does not provide the required summary of issues discussed in the first-tier PEIRs, nor does it adequately incorporate by reference the analysis from these documents.

The RDEIR/EIS also fails to acknowledge that the Authority previously found the Project as a whole would cause significant and unavoidable impacts, requiring a Statement of Overriding Considerations. CEQA requires the Authority to squarely address the Project's contribution to these significant and unavoidable impacts. (*Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 124-125 (CBE).) By concluding that many impacts will be mitigated to less-than-significant levels, without acknowledging and addressing the significant and unavoidable impacts associated with the Project, the RDEIR/EIS obscures impacts rather than reveals them.

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**3. The Authority has Improperly Segmented or Piecemealed Its Environmental Review**

According to the Revised 2012 Business Plan and "Construction Package 1" (CP1) Request for Proposal (RFP) documents, the Section is a part of the "Initial Construction Segment" (ICS) that the Authority intends to build first, using federal and Proposition 1a funding. The 130-mile long ICS will be used to test HSR trains and may be used for Amtrak service. The Authority improperly piecemealed its environmental review for the ICS by preparing two EIRs to analyze its impacts. Instead, the entire ICS should have been analyzed in a single EIR.

The Authority also piecemealed environmental review for the Section and ICS by failing to analyze the impacts of train testing and possible Amtrak service on the ICS. The RDEIR/EIS acknowledges that the first use will occur and that the second use may occur, and yet it does not analyze the unique impacts associated with these foreseeable future actions.

L005-9

**4. The Project Description Is Uncertain and Incomplete.**

The description of the Project is ambiguous and unstable because it fails to identify a "proposed project" and instead identifies not less than 72 possible high speed train (HST) alignment combination alternatives and five heavy maintenance facility (HMF) alternatives, only one of which will be identified in the Final EIR/EIS as the preferred alternative. This approach is contrary to NEPA, which considers the project description to be "the heart of the EIS" and requires the EIS to analyze a proposed project and alternatives. (40 CFR §§ 1502.14, 1502.16(d).) It also is contrary to CEQA, which considers an accurate, stable and fixed project description to be the *sine qua non* of a legally sufficient EIR and contemplates the analysis of a "proposed project" and a reasonable range of project alternatives. (*San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655-656 (*San Joaquin Raptor II*); Pub. Resources Code §§ 21100(b)(1), (b)(4); Guidelines § 15124(a).)

The RDEIR/EIS's consideration of these alternatives without identifying which is the proposed project, results in an ambiguous and unstable project description which precludes informed public participation. Although the multiple alignment alternatives give the Authority several options from which to choose, they prevent the public and responsible agencies from knowing which alternative is the "proposed project" to which they should devote substantive attention. By deferring identification of the preferred alternative until the Final EIR/EIS is prepared, the Authority effectively precludes informed public review and comment on the RDEIR/EIS. The use of multiple alternatives with no designated project also obscures and frustrates the fundamental purpose of alternatives, which is to avoid or substantially reduce the proposed project's significant environmental impacts. We noted in our previous comments that unless this defect was remedied, the consideration of additional routes in the revised RDEIR/EIS would only exacerbate the defect. The Authority has not headed this concern. The RDEIR/EIS did not identify which alignment is the proposed "project" and which alignments are project alternatives, which are intended to avoid or substantially reduce the significant effects of the proposed project. Although the RDEIR/EIS stated that nine HST alternatives were being evaluated, in actuality, there are 72 variations of alternatives being proposed. Without identifying a "proposed project", this staggering number of possibilities further confuses and prevents the public and responsible agencies from giving proper attention to the preferred alignment. This flawed approach violates CEQA's substantive, procedural and informational requirements.

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The failure to identify a proposed "project" may be due to the fact that the design of the Project has not reached a point that allows meaningful environmental review. In the City's experience, environmental review of a project is premature until the project design is at the 30% stage. In fact, the Authority's predecessor agency, the Intercity High Speed Rail Commission, stated that at least a 35% level of design would be necessary to carry out environmental review. (Attachment 2. Excerpts from *High Speed Rail Summary Report and Action Plan* (1996), p. 9-4.) The alignment alternatives in the RDEIR/EIS are only at the 15% design stage. Both CEQA and NEPA require environmental review to begin only "at that stage in the development of an action when . . . the effects can be meaningfully evaluated." (40 CFR § 1508.23; Guidelines § 15004(b).) The 15% design is simply too vague to conduct project-level environmental review, as required under CEQA.

As discussed further in Supplement A, the RDEIR/EIS also failed to accurately identify all Project characteristics, as required. (See *Kostka and Zischke, Practice Under the California Environmental Quality Act*, § 12.7, pp. 581-582 (Jan. 2011 update) (*Practice Under CEQA*). Project characteristics not sufficiently described and considered in the RDEIR/EIS include, but are not limited to:

- The design of the proposed downtown Bakersfield station and all associated facilities, including parking facilities;
- New or modified transmission lines and substations that will be necessary, in some areas that lack existing or sufficient electric infrastructure, to provide power to this Segment of the HST system and associated new or modified access roads and spur roads;
- New or modified irrigation and drainage facilities along this Section of the HST system that would be necessary to accommodate the Project;
- New or modified bridges over streams and rivers necessary for HST line crossings;
- Modified freeway interchanges, ramps and approaches and modified frontage roads for the UPRR Alternative (and the other alternatives to the extent these modifications are required);
- Road closures that would be required for each alternative, and any modifications to existing roadways that would be required as a consequence of road closures; and
- New or modified roadway overpasses along this segment of the HST system that would be necessary to accommodate the Section; and

The DEIR does not describe these major Section characteristics and many more minor characteristics in sufficient detail to enable an accurate project-level review of environmental impacts. The lack of detail also denies meaningful public participation and compromises responsible decision-making by public agencies. The Authority must revise the RDEIR/EIS to provide a reasonable, thorough, good faith and objective presentation of the Section's characteristics, the qualities of the affected environment, and the respective environmental consequences of each alternative alignment.

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Without an adequate and thorough project description that includes all components and characteristics of a proposed project, the lead agency cannot conduct an adequate analysis of project impacts, propose adequate mitigation measures or meaningfully evaluate project alternatives. Indeed, the RDEIR/EIS confirms that environmental review of the Project is premature: a number of critical studies are incomplete, the analysis of several significant impacts have been impermissibly deferred, and many mitigation measures are in only the early stages of formulation. In fact, in many places in the RDEIR/EIS, mitigation is vague and undefined (e.g., measures call for working with the community at the time of construction or mitigating at an area or regional level rather than site specific mitigation), violating CEQA's requirements for a project-level EIR. This approach does not provide the City, other responsible and trustee agencies, property owners, affected businesses and tens of thousands of residents with any sense of how mitigation will address their specific concerns nor is it clear the mitigation will be effective.

L005-10

**5. The Environmental Baseline is Inadequate for a Complete, Detailed Analysis of Section Impacts.**

The Authority failed to conduct adequate surveys to identify the environmental baseline for Section alternatives with respect to special status plants, endangered and threatened species, wetlands, cultural resources, agricultural resources and socioeconomic conditions. Without this baseline information, it could not conduct meaningful analysis of Section impacts, as required.

The environmental setting constitutes the baseline against which project impacts are measured. (See Guidelines § 15125.) An accurate description of the affected environment is an essential prerequisite for an adequate analysis of Section impacts. (See *Save Our Peninsula Com. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 120-124.) "CEQA requires that the preparers of the EIR conduct the investigation and obtain documentation to support a determination of pre-existing conditions. [Citation.] This is a crucial function of the EIR." (*Id.* at p. 122.) A lead agency has an obligation, for example, to collect information regarding the presence of species that may be impacted by a proposed project. (*Sierra Club v. State Bd. of Forestry* (1994) 7 Cal.4th 1215, 1236, citing §§ 21000, 21002, citations omitted; see also *San Joaquin Raptor/Wildlife Rescue Ctr. v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 726 (*San Joaquin Raptor I*) ["an agency must use its best efforts to find out and disclose all that it reasonably can...."], quoting Guidelines §§ 15144, 15145, italics in original.)

The RDEIR/EIS does not satisfy this fundamental requirement. For example, surveys for special status species have not been conducted. Instead, mitigation measures state that these surveys would not be conducted until later, as part of a future Biological Assessment. (RDEIR/EIS, pp. 3.7-163 and 3.7-185) CEQA, however, prohibits a lead agency from relying on a future study for this critical baseline information. (See, e.g., *San Joaquin Raptor II*, supra, 149 Cal.App.4th at pp. 669 [invalidating EIR that due lack of baseline information on the ground that mitigation measure calling for protocol surveys did not make up for this deficiency].)

The baseline information used for traffic impact analysis is deficient in an additional respect – it is inconsistent as between the types of traffic impacts. With respect to the negative effects that would be caused by road closures, the analysis relies on lower existing levels of traffic to conclude that closures would not have significant impacts. (See, e.g., RDEIR/EIS, pp. 3.2-74 – 3.2-78.) But when it comes to analyzing the Section's future traffic impacts, the analysis relies

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on higher projected future baseline traffic levels to conclude that additional traffic caused by the Section would not be significant. Either the analysis of road closure impacts should take into account higher projected regional traffic or the analysis of Section impacts should use existing traffic baseline conditions. Instead, the analysis "games" the baseline, attempting to have it both ways. The RDEIR/EIS must be revised so that it uses a consistent approach to analyzing the Section's impacts.

L005-11

**6. The Analysis of the Section's Environmental Impacts Is Inadequate.**

NEPA and CEQA require the analysis of potential impacts to be "reasonably thorough" and specific at the project level. (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142, 1150; see also CEQA Guidelines, § 15146 ["The degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying activity which is described in an EIR"].) The RDEIR/EIS is inadequate because it frequently discusses environmental effects in only general terms and fails to quantify the extent of the Project's potential impacts. (*Galante Vineyards v. Monterey Peninsula Water Management District* (1997) 60 Cal.App.4th 1109, 1122-1123.) The RDEIR/EIS purports to be a project-level EIR that provides "site specific detailed analysis." (RDEIR/EIS, p. S-1.) Instead, it deals largely in generalities and frequently fails to quantify the extent of the anticipated impacts. Without such specific information, the public and the decision makers can neither assess the severity of potential impacts nor determine the adequacy and effectiveness of proposed mitigation measures.

The RDEIR/EIS also is inadequate because many of the assumptions, analysis and conclusions regarding potential impacts are not supported by facts, data or other substantial evidence. NEPA and CEQA require a lead agency to explicitly reference the scientific and other sources which support the discussions, analyses and conclusions in an EIS and an EIR, respectively. (40 CFR § 1502.24; *Te-Moak Tribe of Western Shoshone of Nevada v. U.S. Dept of Interior* (9th Cir 2010) 608 F.3d 592; Guidelines § 15147; *Joy Road Area Forest and Watershed Assn. v. California Dept. of Forestry* (2006) 142 Cal.App.4th 656.) As more fully explained in the City's specific comments ([Supplement A](#)), the discussion of many potential environmental impact consists of conclusory statements which are not supported by any scientific data or other facts. Unless they are supported by substantial evidence, the assumptions, analysis and conclusions in the revised RDEIR/EIS will be susceptible to a successful legal challenge.

Except with respect to construction air quality impacts, the RDEIR/EIS completely fails to consider the cumulative impacts of the Section in combination with the neighboring Bakersfield to Palmdale section, which will continue the Project's alignment through the City. The City requests a single, comprehensive analysis of all impacts that the Project will cause to the City. By splitting the route through the City into two sections, the Authority's analysis splits the disclosure of impacts, thereby making those impacts appear less severe.

L005-12

**7. The Proposed Mitigation Measures Are Incomplete and Ineffective.**

NEPA requires an EIS to discuss mitigation measures "in sufficient detail to ensure that environmental consequences have been fairly evaluated." (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142, 1154.) CEQA also requires an EIR to identify specific mitigation measures that will avoid or reduce the significant impacts of a proposed project. (Guidelines § 15126.4.) Proposed mitigation measures must be sufficiently

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specific to ensure they are enforceable and effective. (*Vineyard Area Citizens for Responsible Growth, et al. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 444.) Vague, incomplete or speculative mitigation measures are insufficient under CEQA. (*Federation of Hillside & Canyons Assn. v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260.) As succinctly stated in the CEQA Guidelines, "[m]itigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments." (Guidelines § 15126.4(a)(2).)

The RDEIR/EIS fails to comply with the basic requirements of CEQA for effective and enforceable mitigation. The discussion of mitigation measures in each section of the RDEIR/EIS fails to identify mitigation measures with sufficient specificity to gauge their effectiveness and enforceability. Few, if any, of the recommended measures identify who is to perform the mitigation, what action is required, when the mitigation must be performed, or how it is to be accomplished.

Under NEPA and CEQA, an essential component of an adequate discussion of mitigation measures is an assessment of whether the proposed measures would be effective. (*South Fork Band Council of Western Shoshone of Nevada v. U.S. Dept. Of Interior* (9th Cir. 2009) 588 F.3d 718, 727; *Vineyard, supra*, 40 Cal.4th at p. 444.) The RDEIR/EIS is inadequate because it improperly defers the formulation of necessary mitigation measures. (Guidelines § 15126.4(a)(1)(B); *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 669-671.) In many critical areas, necessary mitigation measures or critical components of the measures are left for future determination. Where the mitigation measures are not identified and agreed on, the conclusion that impacts will be mitigated is unsupported. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95-96.)

In addition, the RDEIR/EIS repeatedly conditions the implementation of necessary mitigation measures with the words "where possible" or "to the extent feasible," which violates CEQA by improperly delegating the determination of whether or what mitigation will be performed to unnamed persons and making it uncertain whether the significant impact will or will not be mitigated to a level below significance. In other instances there are statements made "implement measures to..." but there are no specific measures mentioned, which implies those details will be resolved at a later date. Indeed, the typical discussion concerning impact mitigation identifies the possibility of significant impacts, mentions an array of undefined and generalized mitigation measures that "may" or "could" be implemented and then states the conclusion that the identified potential impacts would not be significant with mitigation. (See, e.g., 3.12-118 - 119 [discussion re SS-MM#4].) The RDEIR/EIS, however, fails to specifically explain how the poorly defined mitigation measures will effectively reduce impacts. (In these respects, the RDEIR/EIS is similar to the environmental review document prepared for the neighboring Merced to Fresno section of the Project). As a result, it is impossible for public and the decision makers to know whether the measures will be effective and enforceable. (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142, 1154; *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 95-96; *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1116-1117; *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 306-307.)

An EIR/EIS is required to evaluate feasible mitigation measures proposed by the public or responsible agencies. (Guidelines § 15126.4(a)(1)(A), (B).) The Authority undoubtedly will receive suggestions for feasible mitigation measures that may further avoid or reduce the

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severity of the Section's significant impacts. The City requests that these mitigation measures be adopted and, if they are not adopted, that the RDEIR/EIS explain the reasons for not doing so and provide evidentiary support for those explanations.

L005-13

**8. Impacts Caused by Mitigation are Inadequately Analyzed, or Not Analyzed at All.**

"An EIR is required to discuss the impacts of mitigation measures." (*Save Our Peninsula Com. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 130 (*Save Our Peninsula*); see also CEQA Guidelines, § 15126.4(a)(1)(D).) The RDEIR/EIS fails to satisfy this CEQA requirement in numerous respects. Below, we discuss some, but not all, unaddressed mitigation impacts.

**a. Failure to Analyze Impacts Caused by Mitigation Measures Calling for Freeway and Roadway Modifications**

The DEIR describes many traffic mitigation measures that would themselves cause impacts. (See RDEIR, p. 3.2-129.) Widening roadways and adding lanes at many intersections throughout the region will certainly cause traffic, air quality, noise and other impacts that must be analyzed. The RDEIR/EIS states, however, **without any supporting evidence** that "[n]one of these mitigation measures would create secondary significant impacts." (*Id.* at p. 3.2-128.)

**b. Failure to Analyze Impacts Caused by Sound Walls**

To address noise impacts, the DEIR includes a mitigation measure that allows the construction of sound barriers/walls as a possible measure. (See, e.g., RDEIR, p. 3.4-53.) The DEIR includes maps that identify "potential mitigation noise locations" but it does not specify where such sound walls would likely be built, or identify criteria to determine the location and characteristics of sound walls. (*Id.* at pp. 3.4-55 - 3.4-64.) While the DEIR acknowledges that sound walls may have visual impacts, it fails to analyze such impacts at a site-specific level or suggest any measures that could reduce those impacts. (*Id.* at p. 3.4-72.) The Authority could have consulted with the City during its preparation of the RDEIR/EIS regarding the location and design of sound walls through the City, so that it could perform the required site-specific analysis of secondary impacts, but it failed to do so.

**c. Failure to Analyze Impacts Caused by Habitat Restoration Activities**

Some mitigation measures for impacts to biological resources call for habitat restoration and enhancement activities. (See, e.g., RDEIR, p. 3.7-185 - 3.7-287 [Bio-MM#62].) While these activities may be considered benign, they can have adverse environmental impacts that the Authority must analyze. (See, e.g., *California Farm Bureau Federation v. California Wildlife Conservation Bd.* (2006) 143 Cal.App.4th 173, 195.)

L005-14

**9. The RDEIR/EIS Did Not Consider a Reasonable Range of Alternatives.**

An EIR/EIS is required to analyze a reasonable range of alternatives that will fulfill the fundamental objectives of a proposed project and will avoid or substantially reduce any of its significant environmental effects. (40 CFR § 1502.14; Guidelines § 15126.6.) Under CEQA, it is the lead agency's responsibility, not the public's or responsible agencies' duty to identify feasible alternatives. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405.) The range of alternatives discussed in an EIR must be sufficiently broad that it "will foster informed decision making and public participation." (Guidelines §

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15126.6(a): *Center for Biological Diversity v. U.S. Dept. Of Interior* (9th Cir. 2010) 623 F.3d 633, 642-643.) The existence of reasonable but unexamined alternatives renders an EIS inadequate. (*Ibid.*)

The RDEIR/EIS fails to comply with NEPA and CEQA because it did not consider a reasonable range of alternatives and instead, except for the mandatory "no project" alternative, examined only minor variations in portions of the proposed alignment. The RDEIR/EIS' failure to consider other alternatives that could avoid or substantially reduce any of the Project's significant impacts, such as an alignment that follows established transportation corridors (e.g., SR-99 or I-5) or an alternative technology that would avoid or minimize one or more significant impacts (e.g., maglev), renders the analysis inadequate and incomplete.

L005-15

**10. The Authority Must Provide Meaningful Responses to the City's Comments.**

NEPA and CEQA require a lead agency to provide meaningful responses to public and agency comments. (40 CFR § 1503.4; Pub. Resources Code § 21091(d)(2); Guidelines § 15088.) "Comment noted" is not a meaningful response. If a comment does not warrant further response, the lead agency is required to explain why, "citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response." (40 CFR § 1503.4(a)(5).) The lead agency's responses to comments must describe the disposition of all significant environmental issues raised in the comments and must provide detailed, reasoned, good-faith analysis of the issues raised. (Guidelines § 15088(c); see also *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715, 722-723 (SCOPE).) Conclusory statements unsupported by factual information are not an adequate response. (*Ibid.*) An EIS cannot ignore reputable scientific criticism. (*City of Camel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142, 1151, citing *Seattle Audubon Soc. v. Espy* (9th Cir.1993) 998 F.2d 699.) Accordingly, reasoned, factually supported responses are particularly important where the comments are made by responsible agencies or by experts. (*Berkeley Keep Jets over the Bay v. Board of Port Commrs.* (2001) 94 Cal.App.4th 1344, 1367, 1371.)

L005-16

**CONCLUSION**

The City appreciates the opportunity to provide these comments. The Project and its potential significant environmental effects are of enormous interest to the City and its residents. The general comments set forth above and the specific comment contained in Supplement A are based on the experience and expertise of City staff and the experts retained by the City to evaluate the adequacy of the RDEIR/EIS. The City trusts that the Authority will fulfill its statutory duty to provide detailed, reasoned and meaningful responses to the numerous significant environmental issues raised in these comments. Furthermore, because these and other comments will likely prompt substantial revisions to the RDEIR/EIS, the Authority will likely be required to recirculate the revised analysis for yet another round of public review and comment.

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Lastly, the RDEIR/EIS states that responses to comments previously made to the initial RDEIR/EIS in October 2011 will also be addressed in the Final EIR/EIS. Therefore, we have included a copy of our previous comments to be included as part of the record of proceedings for the project (see Attachment 7). Furthermore, members of the public have submitted comments regarding the project to the City Council either by mail or electronically. Since we do not know if these comments were also sent to the Authority, we have included those letters with this correspondence so that they may also be considered as formal comments on the RDEIR/EIS (see Attachment 4).

Respectfully,

  
Jim Eggert,  
Planning Director

**Enclosures**

cc: David Valenstein, USDOT Federal Railroad Administration  
Zachary Simmons, US Army Corps of Engineers  
Mayor and Councilmembers  
Alan Tandy, City Manager  
Virginia Gennaro, City Attorney  
Raul Rojas, Public Works Director  
Doug Malsaac, Community Development Director  
Rhonda Smiley, Asst. to City Manager  
Steve Teglia, Asst. to City Manager

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**SUPPLEMENT A**

**SPECIFIC ENVIRONMENTAL ISSUES/COMMENTS  
FRESNO TO BAKERSFIELD SECTION RDEIR/EIS**

L005-17

**GENERAL**

1. *State Agency's Non-compliance with CEQA:* The lead agency for the project is identified as the California High Speed Rail Authority (Authority), which was established in 1996 as a State entity. As an agency of the State charged with carrying out State law (and responsible for setting an example for CEQA compliance to local agencies across the State and the interested public), please explain why the draft document is not following the letter and the spirit of the California Environmental Quality Act (CEQA) and CEQA Guidelines concerning:
  - a. The massive size of the Revised Draft Environmental Impact Report/Environmental Impact Statement (RDEIR/EIS) and its reliance on thousands of pages of poorly referenced technical appendices;
  - b. Its unsupported assumptions regarding environmental baseline conditions;
  - c. The lack of a "proposed project" and the poorly defined alternative alignment;
  - d. The piecemealing of environmental review, especially with respect to the rest of the Initial Construction Section;
  - e. Its improper deferral of impact analysis and mitigation measures;
  - f. Its narrow range of project alternatives; and
  - g. Its failure to consider all relevant past, present and probable future projects in the analysis of cumulative impacts.

L005-18

2. *Inadequate Comment Period for the Massive RDEIR/EIS:* A DEIR should normally be less than 150 pages, and for proposals of unusual scope or complexity, may be up to 300 pages. (CEQA Guidelines, § 15141.) This draft document is over five times the recommended maximum. The massive size of the RDEIR/EIS and inclusion of thousands of pages of technical discussions technical engineering drawings are unwieldy, even for those familiar with reviewing DEIRs, and is undecipherable to the majority of the general public. Further, although the RDEIR/EIS is many times longer than the recommended maximum, the Authority has refused to allow sufficient additional time for public review and comment. Allowing only 90 days for public comment is patently insufficient to allow for any meaningful opportunity to review and comment on the entire RDEIR/EIS.

L005-19

3. *Inadequate Notice:* The City of Bakersfield (City) received public notice based on its ownership of impacted properties, which was identified by Assessor's parcel numbers on the notice (note: some of these APN numbers were incomplete for proper identification). We presume that other individuals with impacted properties may have also received similar notice and that these notices were sent only to those property owners impacted as identified in "Volume II Appendix 3.1-A - Parcels Within the HSR Footprint". However, the standard form notice only provides a general explanation that the recipient's property may be necessary for construction of one or more alternatives, and notes that selection of a final alignment has not been made. From this notice, a property owner will have no idea if his or her property would be indeed be impacted and what the extent of that impact would be. Without more

L005-19

information, the property owner would not be able to provide an adequate response to the notice, since he or she would not know what alignment is being proposed as opposed to what alignments are being considered as alternatives. The map included in the notice provides no guidance since it shows the entire rail route between Fresno and Bakersfield at a scale that does not help the property owners determine whether and the extent to which their property would be impacted. The maps in Volume II Appendix 3.1-A, depicting the three alternative alignments through the Bakersfield metropolitan area, do show properties affected, but since the alternatives are close together, there is no way to know which properties are affected by which alternative since they are all shown collectively. This is very misleading to those owners.

- a. We suggested in our comments on the prior draft analysis that the notice be rewritten and re-sent to these affected property owners with better maps clearly indicating whether proposed alignments for the Fresno to Bakersfield section (Section) would cause direct or indirect impacts to their property. Although the notice is slightly improved, it fails to provide any meaningful information to affected property owners.
- b. Although more detailed property maps should have been available to the public a very long time ago, there is no way to compare impacted properties of one alignment verses the other in the "Parcels Within HSR Footprint" volume. The maps show all impacted properties together. Therefore, it is not possible for someone to compare alignments and identify any preferences of one over the other based on a comparison of alignment impacts. Additionally, it is noted that some properties that probably should have been shown as impacted since the rail goes over/through them, show no impact at all (no color given). Potentially affected property owners reviewing the route maps will have difficulty finding the information about what the colors mean, especially if their property is shown as impacted. There is no detailed discussion in the RDEIR/EIS as to what these colors depict and what is actually impacted. The RDEIR/EIS still provides no description as to the difference between permanent impact verses temporary impact and what that specifically means to the property owner. Some permanently impacted properties are depicted partially impacted, but what remains may not be usable. In at least some of those instances, the entire property should be conservatively identified as permanently impacted.

L005-20

4. *Inadequate project description:* The RDEIR fails to describe in sufficient detail the Fresno to Bakersfield section (Section) of the High-Speed Rail project (Project).
  - a. The RDEIR/EIS fails to describe in sufficient detail the Section's technical, operational or environmental characteristics, resulting in an inadequate basis analyzing environmental effects in accordance with Section 15124 of the CEQA Guidelines.
  - b. The 15% design level is insufficient for a project-level EIR for a project of this scale and unprecedented level of interference, disturbance and destruction it will cause.
  - c. Operational features are not described with sufficient detail and many assertions lack factual support. For example, various sections of the RDEIR/EIS assume energy

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L005-20

will be sourced from unknowable largely renewable sources yet ignores the problem of obtaining the sufficient energy to simultaneously power hundreds of trains and numerous stations and other facilities, a demand increment equal to a new city being added to the state. This basic information regarding the characteristics of the proposed Section would be required of any private developer and any local agency proposing much smaller projects subject to CEQA's informational and analytical requirements. See other comments related to the RDEIR/EIS discussions regarding project energy estimates, fuel economies and load following generation mix.

- d. Although three alternative routes are shown in Bakersfield, the RDEIR/EIS does not consistently identify them. In preliminary maps provided to the City and public prior to release of the RDEIR/EIS, the alternates were identified as "Blue" and "Red". In the RDEIR/EIS text these alternatives are identified as the BNSF Alternate (previous Blue), Bakersfield South Alternate (previous Red), and a new Bakersfield Hybrid. Chapter 2 (Alternatives) concludes that two alternates named D1-S and D2-N were being carried forward into the RDEIR/EIS evaluation, which we see has been somewhat clarified to correspond to the BSNF and Bakersfield South alternates, respectively. However, in Volume II, which contains the alignment maps, these routes are shown as Alignments B1, B2, and B3 (appears to correspond to BSNF and Bakersfield South, and Bakersfield Hybrid alternates, respectively). The use of the BN, BS and BH abbreviations further confuses readers. In Volume II, which shows the HSR footprint maps, the alternates are not identified or labeled at all. Lastly, the proposed high speed train stations are identified as Bakersfield North, Bakersfield South, and Bakersfield Hybrid Alternates. However, there is no north alternative so it would have been clearer to have identified this station as the BNSF Station to correlate to the rail alignment since this may not be readily apparent to the reader.
- e. To conclude, by not consistently identifying the alternative routes and corresponding stations, it makes it extremely difficult for the reader to follow a particular alternate through the analysis process and attempt to compare them with the maps contained in the other volumes. The inconsistent description of the project fails to comply with the basic CEQA requirement that an EIR provide "an accurate, stable and consistent project description. The failure to provide a stable and consistent description of the proposed project causes the EIR to be inadequate and requires the description of the project to be revised and recirculated for public review. (See *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 197; *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655.)

L005-21

5. **Inadequate Environmental Baseline:** The RDEIR/EIS does not contain a discussion of the environmental setting that establishes the baseline physical conditions to determine whether an impact is significant. This makes it difficult if not impossible to ascertain if significant environmental impacts were adequately investigated and discussed, and if meaningful mitigation is being proposed in accordance with Section 15125 of the CEQA Guidelines.

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L005-21

6. **Failure to Analyze Impacts to City Facilities and Resources:** The RDEIR/EIS fails to adequately analyze the alternative alignments impacts to numerous City buildings, resources and infrastructure, including, but not limited to:
  - a. **The City's Corporation Yard:** the 14±acre Corporation Yard is an essential centrally-located facility that provides essential City services and critical support for City equipment. The City does not own any comparable properties where these services and facilities could feasibly be transferred to, and the proposed BNSF alignment north of the BNSF track in this area would completely destroy the utility of this critical City facility.
  - b. **Parking Facilities for City Personnel and Rabobank Arena:** The City owns several parking lots to the east of the Corporation Yard and north of the BNSF rail alignment. The proposed BNSF Alignment in this area would destroy these parking facilities. While the RDEIR/EIS acknowledges a portion of the impacts, it does not accurately describe the severity of the impact, and assumes, with no supporting evidence, that the impacts can be minimized. (RDEIR/EIS, p. 3.2-111.)
  - c. **Bakersfield High School Facilities:** While the RDEIR/EIS acknowledges the importance of Bakersfield High School (BHS) to the community and to the current and future students (RDEIR/EIS, p. 3.12-39), the analysis of impacts fails to address the full extent of impacts to this resource (*Id.* at pp. 3.12-50 – 51, 68-69, [assuming, without supporting evidence, that construction period impacts to BHS can be reduced to less-than-significant levels]). The analysis also assumes that the impact can be "minimized" (but not eliminated) through vague mitigation measures.
  - d. **Westside Parkway:** this project, which is currently under construction, is a new east-west freeway extending from Truxtun Avenue to Heath Road. Phase 2 includes a six-lane freeway from Mohawk Street to Allen Road (4.25 miles) with full interchanges at Mohawk Street, Coffee Road and Calloway Drive. The project also includes a bridge over the Parkway at Jewetta Avenue, a signalized intersection at Allen Road, and sound walls adjacent to residential areas.
  - e. **Proposed and Planned Centennial Corridor Project:** the Centennial Corridor project would provide a new alignment for State Route 58 that would be a continuous route along State Route 58 from Interstate 5 via the Westside Parkway to Cottonwood Road on existing State Route 58, east of State Route 99. The RDEIR/EIS acknowledges this major transportation project as planned, but it fails to evaluate the Section alignment alternatives' consistency with the City's current plans for this project.
  - f. **South Mill Creek Redevelopment Project:** South Mill Creek, a new redevelopment project completed this year, is generally bounded by 'N' Street, California Avenue, 'S' Street and the BNSF railway, and would be adjacent to the proposed Bakersfield HSR station. This project is an approximate 20-acre mixed-use development which includes over 160 affordable housing units, and approximately 100,000 square feet of commercial uses on a former brownfield site. The failure to discuss potential impacts on the residents of these affordable housing units, including the sensitive receptors located there, renders the RDEIR/EIS inadequate and incomplete.

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L005-22

7. *Inadequate Effort to Formulate Mitigation Measures (MM)*: Analysis text states that some mitigation may not be feasible because other jurisdictions have control over implementation of the MM or because the mitigation would be too costly. The RDEIR/EIS does not explain what efforts the Authority has made to coordinate mitigation with affected local agencies, including the City. Further, it does not explain whether there are other measures within the Authority's responsibility and jurisdiction that it could implement. Therefore, these MMs are incomplete and inadequate.

Examples:

- a) Section 3.1.4: the City controls street intersections where the Authority may not be allowed to implement changes/improvements. However, the MM does not state how Authority will mitigate the identified impacts if the City does not allow access to the intersection. In addition, the RDEIR/EIS should identify and discuss other mitigation measures and alternatives that are within the jurisdiction of the Authority.
- b) Section 3.4.7.2: the operational noise impact analysis states that exterior sound barriers are not economically feasible, and that installation of building sound proofing (windows, insulation) would be adequate to mitigate interior noise. Please provide evidence and analysis that supports the conclusion that sound barriers are not feasible. Please also provide data that supports the conclusion that building sound proofing would be adequate to mitigate the Project's significant noise impacts.

L005-23

8. *Conflicting Information*: There are numerous instances of inconsistencies, including contradictions between mitigations and conflicting data in the RDEIR/EIS and the Technical Studies.
- o Example of conflicting mitigation: The air impacts of the Bakersfield portion of the High-Speed Train (HST) to schools during construction are to be mitigated by rescheduling HST related construction to non-school hours near affected schools, however the Bakersfield criteria for noise dictates that no noise activity is to occur during certain hours in proximity to sensitive receptors. Although the Health Risk is a critical issue, adherence with the noise ordinance is required. In order for the proposed mitigation measure to be realistic and protect the health and welfare of inner city children, the HST would only be allowed to construct on weekends and for short periods during certain holidays.
  - o Examples of conflicting data and information: Emissions from Power Generating Facilities - The HST project would increase electrical generation requirements compared to the No Project Alternative and Existing Conditions. Analysts estimated the electrical demands resulting from the propulsion of the trains to be 16.55 to 11.04 gigawatt hours per day, respectively (corresponding to the ticket price range 50% or 83% of airfare) compared to the No Project Alternative in 2035, and for the Existing Condition scenario in 2009. Thus the RDEIR/EIS indicates higher energy demands for the lower ticket price. But the following impact analysis comes to an opposite conclusion.

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L005-23

- o Impact PU&E#17 – Project Impacts—Common Energy Impacts: the document states "...This energy estimate, reflecting a refinement of the analysis conducted in the 2005 Bay Area to Central Valley Program EIR/EIS energy assessment, utilizes current conversion factors, ridership forecasts, train sets, and vehicle miles traveled. This is an increase in electric energy consumption of approximately 28,404 MMBtu per day, or less than 1% of statewide consumption under the 50% fare scenario and less than 1.5% of statewide consumption under the 83% fare scenario." (RDEIR/EIS, p. 3.6-72.) However, the 50% fare would have greater ridership and more trips, not fewer. In other sections of the RDEIR/EIS the opposite statements are made. (Also, please confirm that the comparison is with the 2008 Bay Area PEIR and not the 2005 Statewide PEIR, the reference to the prior PEIR in the above quote is inaccurate and confusing.)
- o Table 3.3-7, "BNSF Alternative At-Grade and Elevated Alignment Construction Emissions for Years 2013–2022a (tons/year)" does not report any emissions; additionally it does not match the Air Quality Appendix.

The above examples are typical of inconsistencies found throughout the RDEIR/EIS.

L005-24

9. There is no mention of need for "Statement of Overriding Considerations" for those impacts that would remain significant even after mitigation (Air, Noise, Traffic, Biological Resources, Aesthetics/Visual Resources, and Cultural Resources).

L005-25

10. The 2010 Federal Census shows that, within the City, 45.5 % of the total population is of an ethnic origin that is Hispanic or Latino; for Kern County it is 49.2% of the total population. Many of these individuals may read, write or speak only limited English. Because the Section impacts neighborhoods that contain high percentages of this ethnic group, the RDEIR/EIS should be made available in Spanish.

L005-26

11. The Authority recently entered into an agreement with the City of Fresno to create a "Local High Speed Rail Business Support Services Program" with funding in the amount of \$4.6 million, which will in part pay for additional city employees to deal with the numerous complex issues that will affect Fresno area businesses. However, Bakersfield will be placed in a similar situation but no such program has been offered to the City. The City Manager has written a letter to the Authority asking for equal treatment for Bakersfield, but we have not yet received a response to our inquiry (a copy of this letter is in Attachment 5).

L005-27

**PURPOSE**

12. Section 1.4.4 incorrectly states regarding the Bakersfield Thomas Roads Improvement Program (TRIP) that alternative alignments for the Section in Bakersfield would overlap portions of the Centennial Corridor Alternative D between Mohawk Street and Union Avenue. Alternative D was dropped prior to the Centennial Public Update Meeting (May 2011) as a viable alternative for the Centennial Corridor Project. This Section fails to disclose the Section's conflicts with approved plans for the Westside Parkway and the pending plans for the Centennial Corridor project.

L005-28

13. Section 1.5, regarding the tiering process used for reviewing the Project and this Section, fails to: (1) explain how the Bay Area PEIR changed the analysis provided in

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L005-28

the Statewide PEIR, (2) how this RDEIR/EIS uses the information and analysis from the first-tier PEIRs, (3) whether the flaws found in the Bay Area PEIR and revisions to that PEIR affect the analysis of the Section's impacts and whether those flaws have been corrected, (4) whether this Section contributes to significant and unavoidable impacts identified in the first-tier PEIRs, and (5) how this RDEIR/EIS is consistent with the first-tier PEIRs.

L005-29

**ALTERNATIVES**

14. The RDEIR/EIS fails to consider a realistic feasible alternative for the location of the station and the route in the City of Bakersfield.

The RDEIR/EIS considered bypass alternatives to mitigate impacts to sensitive receptors in Corcoran, Allensworth, Hanford and Wasco. Yet only a BNSF alignment alternative and two closely aligned "alternatives" through Bakersfield are presented as the only alternatives considered by the Authority. The RDEIR/EIS does not fully acknowledge the widespread and major impacts that would result from the Section cutting through the City's center and does not mitigate all of the significant impacts. The portion of the Section through the City, as currently designed, would cause significant project related impacts, and yet the Authority has refused to consider all feasible alternatives. One feasible alternative would locate the station in the City along Panama Lane. The rail could easily enter the City along Panama Lane; the station could be located on any of many ideal locations within City limits; the rail would then exit to the west on Panama Lane joining the San Joaquin Valley RR easement at Pacheco Road going to Rosedale Highway at which point the HST returns to an alignment for the Shafter HMF and other alternative routes to the north. This unstudied alternative reduces:

- The construction impacts on sensitive receptors and populations that are economically disadvantaged, located in the center of the city,
- The operational impacts due to the bifurcation of the city center,
- The significant impacts of the station on historically disadvantaged populations,
- Reduces critical road closures in areas of the city with disadvantaged citizens, and
- Impacts to farms, communities and habitats because it would more closely follow existing transportation corridors.]

L005-30

15. The discussion of Section alternative alignments in Section 2.3.2.3 does not satisfy the requirements Section 15126.6 of the CEQA Guidelines. Rather than provide a range of reasonable alternatives to the project or to the location of the project, this section of the Alternatives Chapter of the RDEIR/EIS discusses which alternatives were dropped from further analysis, leaving just two routes within close proximity to one another to carry forward in the analysis. No maps have been provided to show the removed alternatives, nor are the remaining routes identified with the same names in the RDEIR/EIS and maps thereby confusing the reader.

L005-31

16. Page 2-28 (footnote) states that in 2003 the City, along with the Kern Council of Governments and the County of Kern, endorsed the "Truxtun" downtown Bakersfield HST station as the preferred alternative. However, the Truxtun station concept was preliminary at that time and was not accompanied by a proposed HST alignment. The station was shown at grade approximately 30,000 square feet in size, not the multiple storied 100,000+ square foot area as now proposed in the RDEIR/EIS. Furthermore, it was not known at that time that this station location would result in an elevated guide-way (tracks previously were shown at grade) through downtown Bakersfield or that this station location would dictate what has become an essentially fixed HST alignment based upon the minimum design speed for express trains passing through, but not stopping in, Bakersfield. The broad and severe extent of the impacts of this alternative station location and associated rail alignment to established communities, businesses, institutions, and vital governmental facilities was also not known at that time. For these reasons, it is imperative that a CEQA alternative consisting of an HST alignment which bypasses downtown Bakersfield, including an I-5 corridor alignment and alternative station locations, be included as part of the RDEIR/EIS analysis as a potential means to avoid or reduce the significant environmental effects of the project. Concepts considered to be desirable nine years ago, prior to even a general evaluation of their environmental effects, should not preclude the consideration of a reasonable range of feasible CEQA alternatives which meet most of the project objectives and would be effective in avoiding or reducing significant environmental effects.

L005-32

17. In Section 2.4.4.3, there is a general description of the three station locations, but there is no discussion or analysis as to their impacts upon existing development in the area. Please provide the required analysis of whether and to what extent the project may impact existing development in the areas surrounding each proposed station location.

L005-33

18. Under Section 2.5.3, Ridership and Station Area Planning, the second paragraph states that research suggests that the percentage of transit passengers arriving/departing transit stations by car and needing to park decreases as land use development and population around the station increases. This may be true for a typical commuter rail system, but the logic is flawed for a project that has been identified as an alternative to air travel with at least half of the trains not even stopping in the city. There are no facts supporting these statements. Demand for parking and supportive transit facilities and services around the station will significantly increase, along with congestion on the local streets. This will, in turn, increase vehicular exhaust emissions negatively affecting local air quality in the area. These issues are not discussed. Please identify the research on which the RDEIR/EIS's statement is based and provide the required analysis of potential impacts on traffic, parking, and air quality.

L005-34

19. We question the statement that the "dwell time" at stations for passenger loading and unloading only takes 90 seconds. (RDEIR/EIS, p. 2-103.) This figure seems incorrect and an underestimation. Please identify the facts or data on which this statement is based.

L005-35

20. The no project alternative discussion is inadequate and fails to meet any of the requirements under Section 15126.6(c) of the CEQA Guidelines. Only some of the impact analysis sections include discussion of the no project alternative relative to the

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L005-35

environmental effect. However, this incomplete and inconsistent approach to evaluating a no project alternative makes it difficult to determine if the no project alternative is a relevant alternative. Furthermore, there are no facts provided to determine if the no project alternative is or is not environmentally superior.

L005-36

21. Section 2.7 states that

"The HST will be most successful, and will best fulfill the intent of the voters and Legislature, if it is coordinated with sprawl-reducing and environment-improving land use development patterns. Accordingly, the Authority has adopted HST Station Area Development Policies based on the following premise: For the high-speed train to be more useful and yield the most benefit, it is important that the stations be placed where there will be a high density of population, jobs, commercial activities, entertainment, and other activities that generate personal trips."

We have found no basis for the Authority's assertion that these policies reflect the intent of the Legislature and voters in formulating and approving Proposition 1A. The RDEIR/EIS certainly does not explain how these policies reflect these intentions. Despite the desire of the Authority to base route alignment decisions upon these policies, the RDEIR/EIS indicates that an HST system would serve as an alternative to private vehicles, bus, rail, and air modes of transportation for intercity travel and, therefore, does not require stations to be sited within dense urban centers. Now that the project-level environmental effects of a downtown Bakersfield station and the resulting HST alignment are beginning to be realized, the time is ripe to evaluate the merits of the station and alignment alternatives carried forward for analysis relative to potential alternatives. Instead, it has become increasingly apparent that the Authority's goal is to rush ahead to final engineering design and construction without the required analysis of feasible alternatives that take into account site-specific adverse impacts and without regard for the City's numerous substantial concerns.

L005-37

22. With respect to at least one preliminary alternative which would have avoided downtown Bakersfield but was rejected (Alternative 4), page 2-29 states that "This initial alternative was not carried forward for further consideration as it would not meet the project's purpose and need of providing a downtown station." The need for a downtown Bakersfield station is not among the purposes and needs described in Section 1.2 of the RDEIR/EIS. To preclude the consideration of an alternative outside the downtown area, in spite of the significant environment effects of the preferred alternative, is contrary to the requirements of CEQA Guidelines Section 15126.6(f)(2) (Alternative locations). Furthermore, CEQA is clear that an alternative is not infeasible simply because it may not meet one of the project's objectives. (See *Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal.App.4th 477.)

L005-38

23. Section 2.7.1 states Proposition 1A mandated that HST stations "...be located in areas with good access to local mass transit or other modes of transportation." The ideal station location for the City may well be outside of the City's center. In Metropolitan Bakersfield, current and future planned mass transit consists solely of Golden Empire Transit and Kern Regional Transit bus and dial-a-ride services. Other modes of transportation in Metropolitan Bakersfield consist of private vehicles, taxis, and bicycles. The provision of good access from a Metropolitan Bakersfield HST station to

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local mass transit is not dependent upon a downtown station location. In fact, a significant proportion of HST system users in the Metropolitan Bakersfield area may be more likely to utilize the system if they are not required to travel to the downtown area and, for those utilizing private vehicles and bicycles, to park for an extended period of time in this area. Furthermore, with respect to bicycle accessibility, many areas of Metropolitan Bakersfield are more conveniently accessible to the Kern River Bike Path, a fully grade-separated bikeway which bisects the central portion of Metropolitan Bakersfield in an east-west direction, than to downtown Bakersfield.

L005-39

24. There is substantial evidence in the record and in the Authority's files that funding for the extension of the HST system beyond the Merced to Fresno section and Fresno to Bakersfield section is not and will not be available. Due to the lack of funding for extensions of the HST system beyond these two sections or the Project, travel demand and ridership forecasts should have been studied for a scenario where no future extensions beyond these initial sections are constructed. By doing so, a comparison of the benefits versus the environmental effects of the project studied in the RDEIR/EIS would be possible, which is necessary in order for the Authority's decision makers to formulate a statement of overriding considerations, as required under CEQA, in conjunction with project approval.

Alternatively, if the HST benefits are derived based on a full ridership Project Description, then the HST RDEIR/EIS should study the entire Project including the projected track through East Bakersfield (the portion now included in the Bakersfield to Palmdale section) as opposed to the piecemeal analysis which ignores potentially severe impacts to one of Bakersfield's more challenged urban locations.

L005-40

**TRANSPORTATION**

25. *Underestimated Traffic Generated by Section of Project:* In Section 3.2, Transportation, the RDEIR/EIS incorrectly assumes that the daily trips at the planned downtown Bakersfield station are 4,590. That number of vehicle trips corresponds to the number of "Boardings," which is forecast to be 9,200 for the Bakersfield station. There are an equal number of "Alightings." Therefore the number of daily vehicle trips is twice what is indicated in Table 3.2.5. The assumed percentage of trips occurring in the peak hour is 15%. Please identify the data on which this assumption is based. The assumed percentage appears to be too high. Based on local traffic studies on file with the City Traffic Engineer for development projects in Bakersfield, this percentage is between 7 and 10 percent, consistent with locally observed auto peaking characteristics, instead of local bus peaking characteristics, which are typically 30% in the AM peak period and 30% in the PM peak period. The local transit peak hour percentages are a function of work and school trips being the prominent trip purposes for local transit trips. To really get the proper % during the peak hour, one should look at the diurnal distribution of traffic on I-5 and SR 99 for automobiles, as these patterns reflect intercity travel. The percentage of trips allocated to peak hours is not supported by substantial evidence and the RDEIR/EIS significantly underestimates vehicle trips for the Bakersfield station.

L005-41

26. *Failure to Coordinate Section Plans with Approved and Pending Major Freeway/Roadway Improvement Projects:* Caltrans in cooperation with the City is currently preparing a Caltrans Project Study Report (PSR), and a Project Report (PR)

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and Environmental Document (EIR/EIS) for the Centennial Corridor Loop Project. This project, which will be adopted as State Route (SR) 58 immediately after construction, provides a continuous route along SR-58 from Interstate 5 (I-5) to Cottonwood Road on existing SR-58, east of SR-99. The proposed continuous route has been divided into three distinct segments. Segment 1 is the furthest eastern segment that would connect the eastern terminus of the Westside Parkway to the existing SR-58 (East) freeway. Segment 2 is composed of what is locally known as the Westside Parkway (WSP) and extends from Heath Road to Mohawk Street, and is currently under construction. Segment 3 extends from I-5 to Heath Road.

Three build alternatives (A, B, & C) are under consideration within Segment 1 of the Centennial Corridor. The proposed HST alignments are in direct conflict with Alternative C. This segment includes future direct connectors from Southbound SR-99 to westbound SR-58 and from eastbound SR 58 to northbound SR 99. The future direct connectors would be located east of the Mohawk Street Interchange, skewing across the BNSF rail yard, and tying into SR-99 near the Rosedale Highway Interchange. The direct connectors are not included in the build alternatives at this time; however, the HST Project cannot preclude the construction of these connectors in the future (see map in [Attachment 6](#)).

Design drawings for these approved and pending projects were previously provided to the HSR Authority staff – but the RDEIR/EIS does not consider the Section's potential to interfere or conflict with these major approved and pending transportation infrastructure projects. (See RDEIR/EIS, pp. 3.2-42 – 3.2-44 [inaccurately describing these projects as unfunded potential projects].) Potential conflicts with HST, which must be addressed in the RDEIR/EIS and, where appropriate, resolved through design changes or mitigation measures, are as follows:

Alignment B1 (BNSF)

- a. The HST vertical profile and the eastbound SR 58 to NB SR 99 connector vertical profile are proposed to be at the same elevation (approx. 475 feet). Elimination of the conflict would require a change in profile of 30 to 40 feet.
- b. HST alignment is proposed to be constructed directly above an active 6 to 8 lane freeway at an extremely high skew for potentially thousands of feet (Centennial Corridor scheduled to be constructed prior to HST).
- c. HST must span 6 to 8 lane mainline freeway plus approaches and auxiliary lanes to the future connectors.
- d. Outrigger placement will be critical. Freeway median cannot accommodate proposed columns for outrigger; thus, requiring widening of the freeway and encroaching onto railroad right-of-way.
- e. Temporary false work placement will impact active freeway for thousands of feet.
- f. Outrigger placement cannot preclude future widening of freeway. Current median width designed to accommodate future lane (possibly HOV).

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- g. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).

Alignment B2 (Bakersfield South/Hybrid)

- a. The HST vertical profile and the eastbound SR 58 to NB SR 99 connector vertical profile are proposed to be at the same elevation (approx. 465 feet). Elimination of the conflict would require a change in profile of 35 to 45 feet.
- b. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).
- c. Centennial Corridor project will construct off-ramp from westbound Centennial Corridor to Mohawk Street interchange. HST profile would possibly need to be raised to provide vertical clearance above off-ramp.

L005-42

27. Regarding the Westside Parkway, which is currently under construction west of SR-99, potential conflicts with HST, which must be addressed in the RDEIR/EIS and, where appropriate, resolved through design changes or mitigation measures, are as follows:

Alignment B1 (BNSF)

- a. HST alignment is proposed to be constructed directly above an active 6 to 8 lane freeway at an extremely high skew for potentially hundreds of feet.
- b. HST must span 6 to 8 lane mainline freeway plus interchange, approaches and auxiliary lanes already in place.
- c. Outrigger placement will be critical. Freeway median cannot accommodate proposed columns for outrigger without sacrificing future widening. Current median width is designed to accommodate future lane (possibly HOV) or a light rail facility.
- d. Temporary false work placement will impact active freeway for hundreds of feet.
- e. Construction activity may affect the commuters directly for extended amount of time with high cost and delays.
- f. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).

Alignment B2 (Bakersfield South/Hybrid)

- a. HST alignment is proposed to be constructed directly above an active 6 to 8 lane freeway at an extremely high skew for potentially hundreds of feet.
- b. HST must span 6 to 8 lane mainline freeway plus interchange, approaches and auxiliary lanes already in place.

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L005-42

- c. Outrigger placement will be critical. Freeway median cannot accommodate proposed columns for outrigger without sacrificing future widening. Current median width is designed to accommodate future lane (possibly HOV) or a light rail facility.
- d. Temporary false work placement will impact active freeway for hundreds of feet.
- e. Construction activity may affect the commuters directly for extended amount of time with high cost and delays.
- f. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).

These potential conflicts with approved, under construction and pending major roadway and freeway projects must be addressed in the RDEIR/EIS – they cannot be deferred until later, as suggested in the Authority's responses to concerns expressed by other city's concerning similar conflicts created by the Merced to Fresno section of the Project. (See, e.g., Merced to Fresno FEIR/EIS, pp. 19-138 – 19-139, 19-150 – 19-151 [City of Madera's comment #582-7 regarding conflicts with city transportation facilities and responses], incorporated herein by reference.)

L005-43

- 28. Page 3.2-33 states that the Golden Empire Transit District is operated by the City. This statement is incorrect. It is a separate agency.

L005-44

- 29. The attached Ridership and Revenue tables (see Attachment 6) indicate the ridership and access modes by station, and the parking requirements at each station. The document indicates the parking requirement to be 7,400 spaces at the Fresno Station. For Bakersfield, the document states, "The station parking areas would accommodate approximately 2,300 parking spaces at the Bakersfield Station." However, the attached table indicates the parking requirement at the Bakersfield station to be 8,100 spaces. Below the topic of Bakersfield Parking Impacts, Bakersfield Area Transit Impacts and Bakersfield Pedestrian and Bicycle Impacts are discussed. The volumes cited match those reported in the attached tables. So clearly the parking requirement is in error.

It is further noted that the attached tables indicate in a footnote that "Egress is mirror of access." This means that there are an equal number of passengers (and associated vehicle trips) de-boarding the trains and leaving the stations. The daily trips reported in Table 3.2-5 are incorrect for several reasons. For Bakersfield, the attached tables note that 1,400 autos are dropping off passengers. Once the autos drop off the passengers, they depart the station -- that is 2,800 vehicle trips. Additionally, there are 2,300 motorized vehicles arriving to park, 400 rental cars being returned, and 400 taxis dropping off passengers. These total 5,900 vehicle trips for the boarding passengers, not the 4,590 daily trips reported in table 3.2-5. Plus there are an equal number of de-boarding related trips. Therefore, there are 11,800 daily trips for Bakersfield and 11,200 daily trips for Fresno.

L005-45

- 30. In the Bakersfield Roadway Segment Impacts (Tables 3.2-28 – 31), there is virtually no difference between the "existing" and the "existing plus project" average daily traffic

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L005-45

volumes. This is counter-intuitive. For example, on 23rd Street, between F Street and Chester Avenue, the RDEIR/EIS indicates that not one extra vehicle will be on the roadway as a result of the HST station being constructed. Please state the evidence which supports the seemingly implausible conclusion that no one will want to use 23rd and Q Streets to get to the nearby station. We did not further look at the individual level of service (LOS) results for the intersections, because with these ADT and station trip activity volume errors, the LOS results would not provide accurate or reliable data to base any conclusion. These errors alone are significant enough to warrant a re-study of traffic impacts.

Tables 3.2-28-31 incorrectly reference some of the street segments (e.g., SR 178 between 23rd Street and Chester Avenue, and 23rd Street between 24th Street and F Street). However, none of the 11,800 vehicles a day traveling to or from the station are apparently traveling along these street segments so we do not know why they are referenced. Under the Future with Project scenario it is easier to tell what roadway segment the authors are referencing.

L005-46

- 31. *Interference with Planning for Grade Separation and Roadway Widening Projects:* The City, Greater Bakersfield Separation of Grade District, and the County of Kern, in coordination with adjacent property owners, have been engaged in defining Specific Plan Lines for the alignments and limits of grade separations along the BNSF Railway at Kratzmeyer Road, Renfro/Jenkins/Reina Roads and West Beltway. The addition of the Section alignment alternatives along the BNSF corridor requires the development of alterations to the previous concept plans for the railroad grade separations and necessitates an accelerated time schedule for construction of the grade separations along Santa Fe Way.

Santa Fe Way is a significant regional north-south route, connecting metropolitan Bakersfield with the cities of Shafter and Wasco. As discussed at the July 14, 2011 meeting, HSRA desires to run the HST under the recently constructed Seventh Standard Road overhead, adjacent to the BNSF Railway. This alignment would restrict future widening of Santa Fe Way to four lanes (currently planned as an ultimate six-lane arterial) and would necessitate the construction of a wall along the westerly abutment. The loss in north-south roadway capacity could be mitigated with the construction of a parallel route comprised of Burbank Street, Zachary Avenue, the West Beltway/BNSF/High-Speed Rail/Santa Fe Way grade separation, and Heath Road.

The West Beltway is planned as an ultimate six-lane freeway. For that reason, the overhead for the proposed high speed rail line should be constructed with a substructure to accommodate this ultimate facility and a superstructure for either two or four lanes. The connecting roadway should provide a minimum of two travel lanes and paved shoulders.

With respect to the proposed Reina Road crossing, the circulation plan calls for a southerly relocation of the crossing with connections to Renfro Road and Jenkins Road to provide a more efficient perpendicular crossing of the railroad and to provide for north-south circulation/travel. The Authority's plans show a Reina Road crossing – the plans must be corrected to the Renfro/Jenkins crossing. The design for the Kratzmeyer Road and Renfro/Jenkins/Reina Roads grade separations should provide for a minimum

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L005-46

55 M.P.H. stopping sight distances on the vertical curves. Both roadways are designated as six-lane arterial streets and therefore a six-lane substructure should be provided to allow for future widening. The superstructure on Kratzmeyer Road and Renfro/Jenkins/Reina Roads should provide for a minimum of four lanes and two lanes, respectively. The overhead structures also need to provide for a minimum of four travel lanes, bike lanes, and a median on Santa Fe Way, adjacent to the High-Speed Rail Project alignment.

Because the preliminary design work and right-of-way coordination for the proposed grade separations along the BNSF Railway at Kratzmeyer Road, Renfro/Jenkins/Reina Roads and West Beltway have been accomplished by our local agencies and adjacent land owners, we recommend that the Santa Fe Way mitigation project (Burbank Street grade separation, West Beltway overhead and connecting roadways), the Kratzmeyer Road grade separation, and the Renfro/Jenkins/Reina Roads grade separation be accomplished as early delivery projects. We also recommend that the full scope of these early delivery projects, including design, right-of-way acquisition, utility relocation and construction, be accomplished by our local agencies through a Joint Agencies Agreement among the Authority, the City, the County of Kern, the City of Shafter and the Greater Bakersfield Separation of Grade District, with funding being provided by the Authority.

L005-47

32. Maps show that Palm Avenue in northwest Bakersfield will be permanently closed. This is a major collector road identified in the General Plan Circulation Element. No mitigation is identified as to where traffic will be directed and if this will result in other nearby roads dropping below level service "C" as indicated in the Plan. Closure is inconsistent with the policies of the General Plan.

There is also an internal inconsistency regarding the Section's impact to Palm Avenue: the photo simulation in Figure 3.16.48 shows Palm going under the track, but the maps show the roadway being closed. Which is correct?

Please identify the nature and extent of impacts that will occur if the project proposes to close Palm Avenue, as well as the mitigation measures necessary to avoid or reduce those impacts.

L005-48

33. This chapter mentions the Westside Parkway project and the pending Centennial Corridor project but it fails to analyze the Section's consistency with these major transportation infrastructure projects within the City. The traffic analysis must be revised to address the consistency between Section alignment alternatives and these two projects.

L005-49

34. Appendix 3.19B Table B-9: the project list for cumulative impacts analysis appears to derive information concerning projects in the City from the Capital Improvement Program (CIP) which is a constantly changing document. Please confirm that the information in Table B-9 was the most current information available at the time the cumulative impacts analysis was prepared.

L005-50

35. Figure 3.2-19 shows the Crosstown Freeway and not Centennial Corridor, this erroneous information must be corrected.

L005-51

36. Page 3.2-74, F Street is already closed. Please correct this information and revise the analysis accordingly.

L005-52

37. Page 3.2-78, Eye Street is already closed. Please correct this information and revise the analysis accordingly.

L005-53

38. Tables 3.2-28, 29, 30 and 31:

No. 17 – SR 178 does not go between 23rd Street and Chester Avenue; No. 31 – 23rd Street does not go between 24th and F Streets.

Please correct this information and revise the analysis accordingly.

L005-54

39. Appendix 3.1-A (sheet 274); both the South Bakersfield and Hybrid alternatives show that the City's corporation yard building will be permanently affected, but no mitigation is identified to reduce the impacts to less than significant. Instead, mitigation is impermissibly deferred. The impacts to the City's corporation yard would adversely affect City services and would require relocation of the corporation yard. Because the City does not own any similar property within its central area, relocation of the Corporation yard would result in substantially increased fuel costs, inefficiencies, and other increased costs associated with maintaining current levels of City services.

L005-55

40. Appendix 3.1-A (sheet 275); The South alternative shows the Police Department shop and City Hall South parking lot affected, but no mitigation is identified to reduce the impacts to less than significant. The impacts must be analyzed in a revised RDEIR/EIS and feasible mitigation must address these impacts.

L005-56

41. A threshold of significance for traffic impacts appears to have been removed:

When calculating the LOS at an intersection, there shall also be mitigation when an intersection delay is 5 seconds or more when the existing LOS is D, E, or F, (see language below).

This rule was included in the previous draft of the RDEIR/EIS as a Bakersfield area requirement but was removed (or not located) in the revised draft. Please clarify that this principle has been applied in the RDEIR/EIS and identify all impacts and mitigation measures associated with its application.

L005-57

42. Please provide details of the Reina Road closure and any alternative access plan, as well as any mitigation for the permanent closure of this road.

L005-58

43. Please provide details of any alternative access plan and/or mitigation for ANY road anticipated as a "permanent closure". Please provide this information for any and all of the HST alternatives that indicate a road closure through the Bakersfield area.

L005-59

44. Conflicts between the HST routes and existing and future road projects (e.g., Westside Parkway, Centennial Corridor, development projects north of Brimhall Rd. between Coffee and Windsong) must be mitigated. The RDEIR/EIS impermissibly defers mitigation of impacts to these projects.

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L005-60

45. Table 2-A-1 No. 135, Rosedale Highway is being designed by TRIP as a 6 lane facility, therefore, mitigation by the Authority must include widening the bridge to 6 lanes since the impact is being caused by the project. Deferring mitigation to be "by others" is not an appropriate mitigation measure under CEQA. (See *Madera Oversight Coalition, Inc. v. County of Madera* (2011) 199 Cal.App.4th 48.)

L005-61

46. Table 2-A-8 No. 3: Same comment as above regarding Table 2-A-1.

L005-62

47. Table 2-A-9 No. 3: Same comment as above regarding Table 2-A-1.

L005-63

48. Table 2-A-9 No 21: Will the Section restrict access to the City Hall South parking lot and will there be loss of parking? These impacts are not discussed and mitigation has not been identified that reduces the impacts to less than significant.

Page 3.2-111, the first full paragraph states that the existing parking lots are affected "to a limited degree." What does this mean? Are the impacts significant? What, if any, mitigation will be provided? Please explain how the existing parking lots will be affected and what "a limited degree" means. In particular, identify the number of parking spaces that may be lost and the mitigation measures proposed to avoid or reduce impacts to the parking lots. Many of the affected parking lots are used heavily on a daily basis – removing spaces will impact the City's limited parking facilities.

L005-64

49. 3.2.7.2 Mitigation Measures for Intersection and Roadway Impacts: The City will need to review and approve any mitigation measures in these areas and may require certain types of mitigation. Please note: revising signal cycle length is not likely something the City would accept.

Has the Authority consulted with the City with respect to the proposed mitigation measures? If so, please identify the person(s) with whom the Authority has consulted, the date(s) the consultation occurred, and the result(s) of the consultation. The failure to identify the precise mitigation necessary and the deferral of mitigation to a later time is a violation of CEQA's fundamental requirements.

L005-65

50. The proposed railroad separations of grades do not meet the City's design criteria as they only have a design speed of 45 mph.

L005-66

51. The right-of-way for Santa Fe Way must be designed at the City's arterial standard.

L005-67

52. The traffic impact analysis for the Section does not account for what has been planned and approved in the northwest area.

L005-68

53. To address the project's impacts of roadways in the northwest area for Seventh Standard Road to Renfro Road, the following construction items are required as part of the rail project's mitigation. The HSRA shall work in cooperation with and be responsible for all administrative costs incurred by the City, other local agencies, and property owners associated with adjustments to approved master plans, Metropolitan Bakersfield General Plan, and zoning designations necessary to accommodate the HSR:

L005-68

a. Santa Fe Way

Designated as an arterial: six lanes with concrete curb and gutter and a raised center median within 110 feet right of way

Traffic conditions to 2035 warrant a minimum of four lanes. Therefore, California High-Speed Rail Authority (HSR) shall be responsible for the following:

- Obtain 110 feet of replacement right of way from approximately 2,200 feet north of Hageman Road to Seventh Standard Road
- Relocate existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) that lie within the existing Santa Fe Way right of way to a location within the 110 feet of replacement right of way, or confirm alternate arrangements with facility owners
- Construct a four-lane roadway with 12-foot travel lanes from approximately 2,200 feet north of Hageman Road to Seventh Standard Road
  - Use a minimum design speed of 65 mph
  - Include a 14-foot raised center median with stamped concrete and concrete curbs to accommodate future expansion to ultimate arterial standard
  - Construct paved shoulder and concrete curb and gutter on east side
  - Construct paved shoulder and bike lane on west side
  - Install fencing adjacent to HST right of way
  - Plant xeriscaping landscape on the east side
- Construct 12-foot right-turn lanes with 120-foot bay tapers and 150-foot storage at the intersections of Kratzmeyer Road/Santa Fe Way connector road, realigned Reina Road, and Renfro Road/Santa Fe Way connector road
- Construct 12-foot left-turn lanes with 120-foot bay tapers and 200-foot storage at the intersections of Kratzmeyer Road/Santa Fe Way connector road, realigned Reina Road, and Renfro Road/Santa Fe Way connector road
- Install traffic signal systems at the intersections of Santa Fe Way and Kratzmeyer Road/Santa Fe Way connector road and Santa Fe Way and Renfro Road/Santa Fe Way connector road
- Install traffic signal interconnect conduit and wiring between the traffic signal systems along Santa Fe Way from Galpin Road to Hageman Road

b. Seventh Standard Road

Designated as an expressway: six lanes with concrete curb and gutter and a raised center median within 110 feet right of way

Existing grade separation at BNSF Railway

HSR shall be responsible for the following:

- Obtain right of way necessary to extend the existing overcrossing to span BNSF, High-Speed Train (HST) and Santa Fe Way rights of way
- Relocate existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the overcrossing extension
- Reconstruct and extend existing overcrossing

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- o Use a minimum design speed of 60 mph
- o Install street lighting on bridge structure
- o Construct drainage facilities on bridge structure
- o Construct concrete curb, gutter and sidewalk
- Construct roadway drainage facilities compatible with future adjacent development (i.e., sump rather than ditches)
- Plant xeriscaping landscape
- Relocate/reconfigure existing intersections which conflict with the overcrossing extension
  - o Signalized intersection of Seventh Standard Road and Galpin Street
  - o Access to property located south of Seventh Standard Road and east of BNSF Railway

c. West Beltway

Future freeway: ultimate six lanes, near-term four lanes within 210 feet right of way

HSR shall be responsible for the following:

- Obtain right of way necessary for a full freeway width grade separation spanning BNSF, HST and Santa Fe Way rights of way
  - o Tapering from 210 feet at touchdown points to approximately 320 feet at bridge abutments
  - o Total structure length approximately 600 feet
- Relocate existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the grade separation
- Construct grade separation structure to accommodate six lane width
  - o Width of 96 feet between flow lines, a raised center median, concrete curb and gutter, and appropriate railing and fencing on both sides of the roadway structure
  - o Use a minimum design speed of 65 mph for vertical curve design
  - o Install street lighting on bridge structure
- Construct grade separation embankment to a width adequate to accommodate a six lane freeway
- Construct four 12-foot lanes with shoulders from the bridge abutments to the touchdown points with a 32-foot center median
- Construct roadway drainage facilities compatible with future adjacent development (i.e., sump rather than ditches)
- Plant xeriscaping landscape

d. Kratzmeyer Road

Designated as an arterial: six lanes with concrete curb and gutter and a raised center median within 110 feet right of way

Planned grade separated crossing of BNSF Railway

Traffic conditions to 2035 warrant a minimum of six lanes. Therefore, HSR shall be responsible for the following:

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- Obtain right of way necessary for a full arterial width grade separation spanning BNSF, HST and Santa Fe Way rights of way
  - o Tapering from 110 feet at touchdown points to 310 feet at bridge abutments
  - o Total structure length approximately 500 feet
- Relocate existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the grade separation
- Realign existing canal
- Construct grade separation structure to accommodate full width arterial street cross section
  - o Width of 96 feet between flow lines, a raised center median (minimum 4 feet in width), concrete curb, gutter and sidewalk, and appropriate railing and fencing on both sides of the roadway structure
  - o Use a minimum design speed of 65 mph for vertical curve design
  - o Install street lighting on bridge structure
  - o Construct concrete curb, gutter and sidewalk
- Construct grade separation embankment to a width adequate to accommodate a full width arterial street
- Construct six 12-foot lanes from the bridge abutments to the touchdown points, with a 14-foot raised center median
- Construct roadway drainage facilities compatible with future adjacent development (i.e., sump rather than ditches)
- Provide bike lanes
- Plant xeriscaping landscape
- Construct an intersection with the Kratzmeyer Road/Santa Fe Way connector road and provide left- and right-turn channelization and install traffic signal system.

e. Kratzmeyer Road/Santa Fe Way connector Road

HSR shall construct a four-lane roadway within 90 feet of right of way to provide connectivity between Kratzmeyer Road and Santa Fe Way

- Use a design speed of 40 mph for horizontal curve design
- Provide left- and right-turn channelization at intersections

Approximate points of connection

- Kratzmeyer Road: 1,270 feet west of Santa Fe Way
- Santa Fe Way: 1,450 feet north of Kratzmeyer Road

Roadway length: 980 feet (approximate)

Roadway width: 68 feet

f. Renfro Road/Jenkins Road

Designated as an arterial: 6 lanes with concrete curb and gutter and a raised center median within 110 feet right of way

Planned grade separated crossing of BNSF Railway

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Traffic conditions to 2035 warrant minimum of 4 lanes, standard arterial width is 6 lanes. Therefore, HSR shall be responsible for the following:

- Obtain right of way necessary for a full arterial width grade separation spanning BNSF, HST and Santa Fe Way rights of way
  - Tapering from 110 feet at touchdown points to 310 feet at bridge abutments
  - Total structure length approximately 350 feet
- Relocate existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the grade separation
- Relocate existing North Kern Water Storage District canal and sump
- Construct grade separation structure to accommodate full width arterial street cross section
  - Distance of 96 feet between flow lines, a raised center median (minimum 4 feet in width), concrete curb, gutter and sidewalk, and appropriate railing and fencing on both sides of the roadway structure
  - Use a minimum design speed of 65 mph for vertical curve design
  - Install street lighting on bridge structure
  - Construct concrete curb, gutter and sidewalk
- Construct grade separation embankment to a width adequate to accommodate a full width arterial street
- Construct six 12-foot lanes from the bridge abutments to the touchdown points, with a 14-foot raised center median
- Provide bike lanes
- Plant xeriscaping landscape
- Construct an intersection with the Renfro Road/Santa Fe Way connector road and provide left- and right-turn channelization and install traffic signal system.

g. Renfro Road/Santa Fe Way connector road

HSR shall construct a two-lane roadway within 60 feet of right of way to provide connectivity between Renfro Road and Santa Fe Way

- Use a design speed of 40 mph for horizontal curve design
- Provide left- and right-turn channelization at intersections

Approximate points of connection

- Renfro Road: 1,180 feet west of Santa Fe Way
- Santa Fe Way: 1,120 feet north of Renfro Road

Roadway length: 1,800 feet (approximate)

Roadway width: 40 feet

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AIR QUALITY

The HST air impact analysis is seriously flawed for impact analysis in and around the Bakersfield urban area due to the fact that:

- The construction activity alone is sufficient to impede any reasonable further progress toward attainment toward federal standards;
- the quantification of emissions do not match the actual traffic impacts;
- the quantification of emissions does not include a reasonable estimate of emissions associated with the electrical generation requirements of the HST;
- modeling was conducted utilizing Fresno metrological data rather than the Bakersfield data which is substantially different;
- compliance with SJVAPCD Rule 9510 has not been adequately addressed; and
- no meaningful mitigation was included for significant health impacts to school children in the City of Bakersfield and the proposed toxic air mitigation measures conflicted with noise mitigation measures (timing of construction).

These air quality issues are discussed in further detail in this section as follows:

L005-70

54. Section 3.3.1 Introduction – The introduction to the Air Quality Section is inadequate as it presumes, based on optimistic assumptions and not on substantial evidence, that the HST project would have low potential of air quality impacts.

The analysis itself shows significant and unavoidable impacts. The significant and unavoidable impacts on sensitive receptors are not adequately defined because the RDEIR/EIS (1) does not identify the source locations of the added electrical generation needed for normal and emergency operations, (2) does not identify the locations of the sensitive receptors, (3) does not do a complete health risk analysis, and (4) does not have an appropriate cumulative impact analysis within the City and surrounding urban areas.

In general the following issues of concern should be extended to all discussions, quantifications and modeling in the RDEIR/EIS and the Technical Appendices. Although changes were made to the RDEIR/EIS and Technical Appendices, the revisions were not adequate. This is a prior comment which remains unaddressed.

L005-71

55. Section 3.3.4.2. The RDEIR/EIS states that if more recent modeling were used to quantify the benefits of the HST for air emissions that the conclusions of the RDEIR/EIS would remain unchanged. However, the RDEIR/EIS downplays the project impacts and overstates the project benefits. If the RDEIR/EIS adequately quantified the future improvements to fuel economy mandated by law and adequately quantified the electrical energy consumption impact, the project benefits would be significantly less than portrayed and the project RDEIR/EIS could possibly show a significant and unavoidable impact.

L005-72

56. Section 3.3.4.2. Power Plant Emissions – The RDEIR/EIS underestimates pollutant emissions (GHG, toxics and criteria) by using state averages which do not correspond to peak electrical demand of the HST.

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As mentioned previously, the RDEIR/EIS assumes that all Project electricity would be taken off the CAISO controlled grid and that the additional demand would be met by statewide generation on an average basis. The use of statewide emissions factors understates the emissions impacts for the added generation needed for the Project, however, because the Project will increase the overall demand for electricity in the State.

- a. The current system has steadily experienced erosion of the in-state reserve capacity and does not have adequate reserve capacity for another 1000 MW of demand. Therefore, the additional 1000 MW must be considered as "new load" requiring added generation and the project must account for the added demand as being separate of the generation fleet used in the CARB Scoping Plan and related regulatory baseline.
- b. Additional criteria and toxic pollutants will be emitted by the added electrical generation for the HST at facility-based emissions factors—not the statewide average which includes the existing non-fossil fired mix. The RDEIR/EIS discussion of estimated demand for electricity must be followed by both an accurate description of energy sources and generation capacity; only by including this information can the reader and decision makers confirm that the HST will have a steady supply to meet its substantial demand. If the electricity supply is insufficient, the CAISO acting as the grid operator will have to call on additional generation to meet the transient load so as to maintain the appropriate voltage and frequency stability required by FERC and NERC. Any resultant increases in ancillary power production due to increased transient demand within control nodes and penalties due to HST induced system failures may affect the CAISO and result in additional dispatch of high heat rate peaker generation. This possibility must be considered in the air quality impact analysis.
- c. The HST Project will be functionally equivalent to the addition of an entire city's worth of electricity demand. The RDEIR/EIS assumes that sufficient electricity will be supplied by existing generating facilities. This assumptions must be substantiated -- please provide evidence of contracts for the added electricity demand in terms of the actual demand profile or clarify in the project description by including information regarding those expected sources of electrical generation. Without this information, the Authority cannot make claims concerning the nature of the electric generation both in terms of emissions and location. The Central Valley is a tightly constrained and closed air shed and impacts due to new generation are not adequately addressed in the RDEIR/EIS. This is a previous comment which has not been adequately addressed.
- d. Section 3.3.4.2. Power Plant Emissions and Air Quality Technical Report: Section 6.3 -- The RDEIR/EIS inadequately represents the criteria and toxic pollutant impacts and GHG effects by claiming use of renewable sources of electricity rather than fossil-fuel derived peak load electricity.
- e. The introduction of GHG initiatives such as the Renewable Portfolio Standard (RPS), Cap-and-Trade and the elimination of once-through cooling generation will reduce the availability of the non-renewable energy fleet upon which reserve capacity heavily relies. The RDEIR/EIS states that the HST will use "renewable

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sources" to derive the required electricity but fails to account for the fact that all renewable sources currently built and planned are already nominated into the electrical system for the benefit of the existing sectors (i.e., industrial, commercial and residential). The impacts of additional electricity demand in the context of emissions must be properly counted for in the RDEIR/EIS, including criteria pollutant impacts, and health impacts.

- f. The utilities supplying the Project's electricity will likely need additional GHG allowances in order to provide the additional 8.32 GWh per day (RDEIR/EIS Air Technical Report, p. 3.3-51). According to CARB's cap and trade credit auction schedule, these allowances must come from a steadily reduced pool of GHG allowance allocation. Mitigation should be required to offset the increments in terms of surplus real and quantifiable reductions in the affected air sheds or by protocols approved by CARB.]
- g. The HST's potential use of renewable will be largely limited to solar generation since wind derived electricity is limited to night time when wind speeds reach sufficient velocity to achieve cut-in. Therefore, the additional 1000MW of actual demand created by the HST operations cycle must be considered new load requiring added generation, and the project must account for the added demand separate of the generation fleet used in the CARB Scoping Plan and related regulation. The Section's impacts must be disclosed and mitigated now, at the project-level of environmental review; therefore the RDEIR/EIS should show substantive evidence of contracts for renewable electricity and clarify in the project description the sources of electrical generation before making claims concerning the nature of the electric generation both in terms of emissions and location. Any added generation needed for HST new load must be designed for the HST load profile and not rely on the state average. The resultant emission impacts should be based on the location of the new generation and not assumed to be spread out so as to minimize disclosure of disproportionate impacts to the sensitive receptors. Although the train moves, the stationary electricity sources stay where they are and run at varying loads. Criteria pollutants are emitted in greater concentration at varying load conditions and GHG-related emissions per unit of electrical energy generated are much greater due to the inefficiency of part load operation. Simply put, the Central Valley is a closed air shed and impacts due to new generation due to the HST are not addressed in the RDEIR/EIS.

L005-73

57. 3.3. Impact AQ-10, Table 3.3-11, Summary of Regional Changes in Operational Emissions -- The RDEIR/EIS inadequately presents the local impacts of the HST-related electricity generation by spreading the HST related pollutant emissions (GHG, toxics and criteria) over the entire state.
- a. The reserve margin criteria for generation in the ISO control zones will dictate that new fossil-fired generation will have to be constructed to replace phased out once-through-cooling-based generation assets as well as to replace existing fossil-fired units that have now lost their capacity payments in previous Standard Offer Contracts and will shutter due to poor economic returns.] Kern, Fresno, Tulare and Kings Counties are home to approximately 30% of the fossil-fired generation in the CAISO control area. Many of these new fossil-fired generation assets (those presumably needed to support the HST) will very likely be constructed in the San

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L005-73	<p style="text-align: right;">Supplement A page 25</p> <p>Joaquin Air Basin, particularly in Kern County. These foreseeable projects must be considered in cumulative impacts analysis.</p> <p>b. The RDEIR/EIS states that "[b]ecause the regional emissions for the applicable pollutants are lower under the operational phase of the HST alternatives than for the No Project Alternative, only emissions generated during the construction phase need to be compared to these threshold values to determine whether the GC Rule is applicable." (p. 3.3-68.) This interpretation relies entirely on the unsupported assumption that there is excess capacity for the added electrical demand particularly in the renewable fleet. Progress data from the state's RPS conversion program and the resource availability trends do not support this assumption. This inadequacy, which understates the emissions impacts, extends throughout the air analysis.</p> <p>c. No Voltage Stability information has been provided supporting the HST claims that (1) the generation mix is statewide, (2) the HST can use existing generation from unknown sources, and therefore (3) the study cannot consider individual generation facility related impacts.</p> <p>d. Local Control Areas are studied in sufficient granularity to allow impact analysis on a regional basis. Because both affected areas and generation resources are easily identified, the analysis must be more precise and specific.</p>	L005-76
L005-74	<p>58. "The LCR needs are steady in Humboldt and Stockton. The LCR needs have slightly increased in North Coast/North Bay, Bay Area and Kern due to load growth..." (CAISO, "2013 LOCAL CAPACITY TECHNICAL ANALYSIS FINAL REPORT AND STUDY RESULTS", <i>[emphasis added]</i>). As part of the reliability contingency requirements, in anticipation of any episodic shortage in system-wide and local generation resources, the CAISO has an obligation to design and implement an under-voltage load shed plan to protect control areas against long-term and classical voltage collapse. In order to do this, the effect on the transmission system of lower voltage distributed transformer load tap changes and over-excitation (such as those associated with the passing of an HST at any one or several of the 17 identified HST distribution locations) must be simulated in the context of voltage support capability. While this seems complicated, it is essential to the understanding of the actual project implementation as it relates to future siting of HST-related generation. Historic examples of locations that have experienced long-term voltage collapse are Sweden, Japan, and France.]</p>	L005-77
L005-75	<p>59. The construction of generation facilities will not be subject to review if they generate and tie into the grid at below 200kV. If the RDEIR/EIS fails to consider the construction of need following generation in specific locations then this loophole would allow the HST to construct generation facilities at the 17 distribution locations and circumvent the intent of CEQA by using the 115kV, the 66kV systems, with a statement that the most likely locations are presently unknown and unknowable. The most likely locations are identified at each TPSS distribution locations which tie into the 115kV as is the case with West Park TPSS which is in the City adjacent to the Kern River Parkway.</p>	L005-78
L005-76	<p>60. Section 3.3.4.5 and Air Quality Technical Report – The RDEIR/EIS does not adequately address the PM10 and PM2.5 impacts to Bakersfield.</p>	
	<p style="text-align: right;">Supplement A page 26</p> <p>a. PM10, PM2.5 and their precursors have been shown by study and analysis for the last 20 years to be primarily a local source problem exacerbated by the San Joaquin Valley (SJV) air basin geography and is not shared throughout the state or even throughout the valley. The localized sources have localized impacts.</p> <p>b. The construction impacts between the years 2013 and 2020 show significant impacts from PM10, PM2.5 and NOx (which is a precursor to PM2.5). By not modeling to the PSD (Prevention of Significant Deterioration) SIL (Significant Impact Levels) and simply stating that a qualitative analysis is appropriate does not allow the reader to consider the project related impacts on the progress toward attainment at the Bakersfield Golden State Monitoring Station. The project emissions will cause substantive increases in the PM2.5 further delaying the progress toward attainment in the Bakersfield area and increasing the adverse health effects.</p> <p>c. EPA has set the attainment date as 2017, which is within the construction period, and thus the construction impacts should be rigorously studied in proximity to each monitoring station as a minimum.</p> <p>References:</p> <p>CARB, "Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions", 2011</p> <p>CARB Documents are available on website: <a href="http://www.arb.ca.gov/planning/sip/planarea/24hrsivpm25.htm">http://www.arb.ca.gov/planning/sip/planarea/24hrsivpm25.htm</a>, "2012 SAN JOAQUIN VALLEY PM2.5 ATTAINMENT PLAN"</p> <p>61. Section 3.3.4.6 Asbestos - The RDEIR/EIS inadequately addresses the risks posed by the release of asbestos during demolition. Instead, it impermissibly defers investigations to determine presence to post-approval.</p> <p>The HST traverses the current and historic city center. Many of the buildings in this area were constructed prior to the asbestos ban. Exposure to nearby sensitive receptors of the massive demolition effort has not been modeled utilizing a reasonable fugitive dust characterization incorporating the expected asbestos releases.</p> <p>62. Section 3.3.4.7 Greenhouse Gas Analysis - The RDEIR/EIS inadequately presents the GHG impacts at all levels.</p> <p>GHG quantification relies heavily on the efficiency of the use of fossil fuel being converted to useful energy (electrical and transportation). The RDEIR/EIS fails to quantify the Project's energy use. Instead, the analysis states the energy will be sourced from unknowable sources, but assumes a heavily reliance on renewables and ignores any facility related GHG generation (arguing that they are simply diminimis) and ignores the impact of a demand increment on the California electrical grid. All of which no other major project subject to CEQA's analysis and mitigation requirements could avoid. See other comments related to the RDEIR/EIS discussions regarding project energy estimates, fuel economies and load following generation mix.</p>	

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L005-79

63. Section 3.3.4.9 Construction Impacts - The RDEIR/EIS does not use the appropriate construction emissions modeling.

The appropriate approved model for construction impact modeling is CalEMod. By relying on the outdated and now abandoned URBEMIS model, the RDEIR/EIS understates the emissions by double counting the load factor and the use factor of construction equipment. The unacknowledged greater construction-period air quality impacts further underscores the need for an adequate and more rigorous local construction analysis in the City.

L005-80

64. Section 3.3.4.9, Air Quality Technical Report: Section 6.7.10 Construction Impacts, and Section 8.0 Mitigation Analysis and Project Design Features - The RDEIR/EIS inadequately presents the local impacts of the HST construction pollutant emissions (GHG, toxics and criteria) in the San Joaquin Valley.

L005-81

65. The project has now agreed to a VERA (Voluntary Emissions Reduction Agreement) for ISR (Indirect Source Review) compliance and the reductions are set to zero net emissions. No copy of the VERA has been provided in the RDEIR/EIS. The use of the VERA program for the Project and its sections reduces the amount of mitigation credits available for other projects in the region. Continued access to diminishing rights to emit indirect source emissions are a critical concern to all businesses seeking approvals to construct.

Additionally, while the RDEIR/EIS admits the construction emissions alone will impede progress of the SJV towards attainment with federal air quality standards; the RDEIR/EIS must also analyze the indirect impacts to business and the public of not reaching attainment in accordance with the current plans.

L005-82

66. Sections 3.3.9 and 3.3.10 - The RDEIR/EIS inadequately presents the local pollutant emissions (toxics and criteria) impacts of the Section by not properly identifying the proximity of sensitive receptors in the City to construction impacts.

The sensitive receptors which include hospitals, schools, residences, convalescent homes, churches, and day care centers along the construction route have not been adequately studied within the City. CAPCOA (California Air Pollution Controls Officers Association), GAMAQI (Guidance for Assessing and Mitigating Air Quality Impacts), and OEHHHA (California Office of Environmental Health Hazard Assessment) require the identification of location, and quantification of impacts to all sensitive receptors, which include health risk assessment as well as criteria pollutant modeling at the project boundaries for the duration of the construction activities including demolition and construction. These requirements have not been satisfied. The modeling for health risk impacts for the City improperly relies on metrological data from Fresno (a city located over 100 miles away). This and other methodology used for health risk assessment does not comply with the guidance documents and policies of those agencies.

GAMAQI states that "CEQA requires that in evaluating the significance of a project's potential air quality impacts, the Lead Agency shall consider both primary (direct) and secondary (indirect) consequences. (CCR§15064(d)) Primary impacts include emissions from project construction and emissions...." OEHHHA guidance indicates any

L005-82

source within ½ mile of a school should be considered due to its likelihood of adverse impact. (See OEHHHA, "GUIDANCE FOR SCHOOL SITE RISK ASSESSMENT", 2004.) Further, the CAPCOA Guidance Document states that "[a]lthough methodology for assessing health risk for construction projects is not included in this document, lead agencies under CEQA are required to identify health risk from construction activities or projects and mitigate if they are deemed significant." (CAPCOA Guidance Document, p. 7, fn 4.)

This RDEIR/EIS does not adequately quantify the construction health risk in and around the HST route passing directly through Bakersfield and its surrounding communities because it uses modeling based on the Fresno meteorology and surrounding areas—the project studies failed to use site-specific data for the City. Furthermore reliance on a VERA does not constitute mitigation for local health risk impacts at the project activity level.

Further, by failing to identify the location of concrete and asphalt batch plants, construction equipment and materials staging areas, and other critical information, the RDEIR/EIS also fails to satisfy CEQA's informational and analysis requirements. Given that this is a project-level EIR, the RDEIR/EIS must specify all the project features so that the impacts associated with the complete Project Description can be identified and the public has adequate opportunity to comment.

L005-83

67. Section 3.3.9 and 3.3.10 - The RDEIR/EIS is inadequate in that the health risk impact from the HMF and Bakersfield station exceeds the standards in AB 2588 at the facility boundary.

AB 2588 prohibits construction of any new stationary source that exceeds this threshold. An override of the AB 2588 health risk protective standards should be discussed in detail. The override of the health protective standards will be precedent setting. This significant impact should have all feasible mitigation applied to achieve a level of no significant impact.

L005-84

68. Section 3.3.9 - The RDEIR/EIS is deficient in the analysis of the operation of the HST station in the City.

Emissions related to delivery of goods and services to and from the station were not quantified. No health risk analysis related to the impacts of the sources of emission at the station was included. The indirect increased emissions at the City wastewater treatment plant from the operation of the station were not quantified. See the previous discussion related to GAMAQI and the CAPCOA Guidance Document. The RDEIR/EIS fails to address the City's prior comments on this issue and dismisses health risk concerns as diminimis.

L005-85

69. RDEIR/EIS and Air Quality Technical Report - The RDEIR/EIS is inadequate in its analysis of the health effects of construction and operation of the HST.

An exhaustive search of the RDEIR/EIS and Appendices did not reveal any consideration or discussion of Valley Fever. Valley Fever has been a well-known and serious health concern in the Central Valley for many years. The RDEIR/EIS fails to consider the impact of fugitive-dust-related health effects from Valley Fever related to

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HST construction and operation. It is well documented that large scale projects such as the California Aqueduct and the construction of I-5 disturbed the soil and increased Valley Fever for both the residents and construction personnel. This impact, and the mitigation measures needed to address it, have not been quantified or analyzed in the RDEIR/EIS.

L005-86

70. Section 3.19 Cumulative Impacts- The RDEIR/EIS inadequately analyzes the cumulative construction and operational impacts because the definitions of certain project elements critical to the analysis within the Project Description are inadequate for impact analysis that may support claims related to the project impacts either on a project level or cumulative context. As an example, the electric generation units that appear on certain plot plans are incorporated in the RDEIR/EIS by reference, but the project description completely fails to discuss the manner in which these facility operations will be limited to protect the SJVAB inhabitants, leaving the HST open to use this generation as low efficiency-high emissions "peakers"—a realistic operational impact that goes unstudied in the context of both direct health protection at the local level and inhibiting reasonable further progress toward attainment of health protective standards on a regional level in the highly impacted SJVAB.

Without documentation or discrete analysis the RDEIR/EIS claims that all of the demolished structures are primarily "industrial" in nature and therefore no cumulative health risk analysis is necessary. However, particularly in the City, the HST Project would impact thousands of homes, numerous schools, churches, and daycare centers. The consideration of cumulative health risk impacts ignores the health risks associated with demolishing these other structures.

L005-87

NOISE

The HST noise assessment is flawed for impact analysis in and around the Bakersfield Area due to the fact that:

- the background noise levels were not properly quantified for the application of noise impact assessment at sensitive receptors(day time related impact, evening related impact, night related impact);
- the modeled impact radii are understated;
- the far-field low frequency impacts to sensitive receptors are not adequately addressed ; and
- the noise mitigation conflicts with the significant health impact mitigation measures proposed in the air impact assessment.

These noise issues are discussed in further detail in this section as follows.

L005-88

71. Impacts to noise-sensitive receivers remain identified as severe and potentially significant after mitigation since there is no guarantee that noise barriers will effectively reduce operational noise to acceptable levels. Elevated guideways constructed through and adjacent to residential neighborhoods represent potentially significant sources of operational noise which likely cannot be fully mitigated. As mentioned previously, a CEQA alternative which bypasses existing Bakersfield communities must be included as part of the RDEIR/EIS analysis as a means to avoid or reduce significant environmental effects, including but not limited to operational noise impacts. Another

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potential alternative which could avoid or reduce significant operational noise impacts is a below-grade system through established Bakersfield communities.

HST Project's train penetration into enclosed areas, such as tunnels, will have a significant localized "pulse effect" which has been identified in tunnel entrances for other existing HSR facilities. The RDEIR/EIS should carefully consider the use of noise barriers and analyze such barriers in the context of low frequency resonance in the vicinity of sensitive receptors such as schools. [Proceedings: Low Frequency 2004, 11th International Meeting Low Frequency Noise and Vibration and Its Control, Maastricht, Netherlands.]

L005-89

72. Section 2-2 - According to the RDEIR/EIS, "The HST System is envisioned as a state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology..." While it is acknowledged that voters who supported Proposition 1A envisioned a state-of-the-art, electrically powered, high-speed train system for California, the voters did not mandate that such a system must utilize steel-wheel-on-steel-rail technology. Existing high-speed rail systems, as well as systems presently under construction throughout the world utilize various technologies, including but not limited to maglev, that have been proven to result in less severe noise impacts than conventional steel-wheel-on-steel-rail technology. Therefore, the inclusion of a CEQA alternative consisting of the implementation of a high-speed rail technology that is more advanced and less environmentally damaging than steel-wheel-on-steel-rail technology is required.

L005-90

73. Section 3.4.5 CEQA Thresholds - The RDEIR/EIS utilizes inadequate CEQA thresholds for noise and vibration. The correct criteria should be used as stated in Appendix G.

From Appendix G:

\*XI. NOISE -- Would the project result in:

- a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?
- c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?
- d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?"

L005-91

74. The City has established noise standards and ordinances that are applicable to the HST project. The RDEIR/EIS noise analysis failed to consider and apply these thresholds to Section construction and operation activities that will impact areas within the City.

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From the City's General Plan Noise Element:

"TABLE VII-2

NOISE LEVEL PERFORMANCE STANDARDS\*  
Exterior Noise Level Standards

Category	Cumulative Number of minutes in any one-hour time period	Daytime	Nighttime
		7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
1	30	55	50
2	15	60	55
3	5	65	60
4	1	70	65
5	0	75	70

\*Each of the noise level standards specified in this table shall be reduced by five (5) dB(A) for pure tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards should be applied at a residential or other noise-sensitive land use and not on the property of a noise-generating land use.

10. STANDARDS FOR PROJECT NOISE IMPACTS FOR MOBILE SOURCES

A significant increase of existing ambient noise levels affecting existing noise sensitive land uses (receptors), and requiring the adoption of practical and feasible mitigation measures, is deemed to occur where a project will cause:

- An increase of the existing ambient noise level by 5 dB or more, where the existing ambient level is less than 60 dB CNEL
- An increase of the existing ambient noise level by 3 dB or more, where the existing ambient level is 60 to 65 dB CNEL;
- An increase of the existing ambient noise level by 1.5 dB or more, where the existing ambient level is greater than 65 dB CNEL.

STANDARDS FOR CUMULATIVE NOISE IMPACTS FOR MOBILE SOURCES

A project's contribution to noise increase would normally be considered cumulatively considerable and considered significant when ambient noise levels affect noise sensitive land uses (receptors) and when the following occurs:

- A project increases the ambient (cumulative without project) noise level by 1 dB or more; and
- The cumulative with project noise levels cause the following:

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- o An increase of the existing ambient noise level by 5 dB or more, where the existing ambient level is less than 60 dB CNEL;
- o An increase of the existing ambient noise level by 3 dB or more, where the existing ambient level is 60 to 65 dB CNEL;
- o An increase on the existing ambient noise level by 1.5 dB or more, where the existing ambient level is greater than 65 dB CNEL."

From the City's Ordinances:

\*9.22.050 Noise during construction.

A. Except as provided herein or in subsection B, C or D of this section, it is unlawful for any person, firm or corporation to erect, demolish, alter or repair any building, or to grade or excavate land, streets or highways, other than between the hours of six a.m. and nine p.m. on weekdays, and between eight a.m. and nine p.m. on weekends; provided, however, that city crews and those of the city's contractors performing street work between nine p.m. and six a.m. are exempt here from if the city engineer has directed that work be performed between such hours to alleviate potential traffic congestion.

B. Notwithstanding any other provisions of this chapter, if the city manager determines that the public health and safety will not be impaired by the erection, demolition, alteration or repair of any building or the excavating and grading of land, streets or highways between the hours of nine p.m. and six a.m., and if he or she further determines that loss or inconvenience would result to any party in interest by virtue of the requirements provided in subsection A of this section, he or she may grant a permit for such work to be done between the hours of nine p.m. and six a.m., upon application being made at the time the permit for the work is awarded or during the progress of the work. Such permit may be granted for a period not to exceed three days, and may be extended by the city manager for a period not to exceed three days.

C. The provisions of this section shall not apply to any work of construction performed one thousand feet or more from the nearest residential dwelling.

D. The provisions of this section shall not apply to performance of emergency work as defined in this chapter. (Ord. 3924 § 3 (part), 1999)"

L005-92

75. Section 3.4. - The RDEIR/EIS fails to properly portray the background conditions (soundscape).

- a. The RDEIR/EIS Background Data are erroneously presented on an Ldn (Day Evening Night Sound Level) basis, which results in disclosure of a smaller area of significant impacts than will actually exist.
- b. The Ldn is the average sound level over a 24 hour period, with a penalty of 10 dB added to data for any given hour for the hours 22:00 to 07:00. The Ldn measurement is not used with respect to background data; it is used for impact

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analysis. Adding 10 dbA to any particular soundscape value based on evening implies that local background should be 10 dbA higher (one order of magnitude higher noise energy) during a given night-time hour. The use of Ldn is appropriate when comparing the project combined increment against a specified threshold, both in Ldn or CNEL (whichever is selected as the basis).

The RDEIR/EIS states "Ldn: The Leq over a 24-hour period, with 10 dB added to nighttime sound levels (between 10 p.m. and 7 a.m.) as a penalty to account for the greater sensitivity and lower background sound levels during this time. The Ldn is the primary noise-level descriptor for rail noise in residential land uses."

The RDEIR/EIS Noise and Vibration Technical Report states that:

To establish a base of existing environmental noise levels for project noise impact assessment, a comprehensive series of noise measurements were made within the study area. A combination of 196 long-term (24 hours in duration) and 207 short-term (60 minutes in duration) noise measurements were taken at noise-sensitive receivers. Some measurement sites included multiple measurements. The ambient noise level measurement locations were selected to be representative of the noise environment most likely to be impacted by train noise. Measurements were completed at single-family and multi-family residences for long-term measurements. Short term measurements were completed at residential and institutional sites (e.g., hospitals, libraries, schools, churches), and were taken to estimate the Ldn at receivers with sleep activity not covered by the 24-hour measurements and to determine the existing conditions at receivers with only daytime activities. [emphasis added]

This argument for using either 24-hour or one-hour monitoring and the misleading application of Ldn adjustments to estimate a pre-existing soundscape described by an single inflated Ldn leaves the reader with no means of understanding how a train passing by in the evening, nighttime and early morning will affect the soundscape. Simply, the Ldn adjustments should be used on the impact (not the existing soundscape) and compared to the Leq for the 24-hour period being considered. The Ldn adjustment made to a proposed project's potential noise impact then takes into account night-time noise sensitivity.

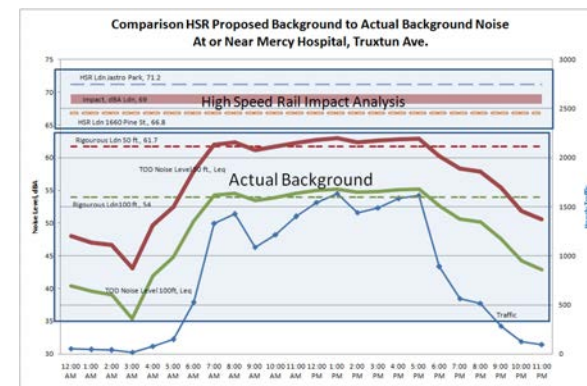
The RDEIR/EIS noise analysis should be revised to answer the question: What is the effect of a passing HST on a specific receptor if the proposed project were built and a noise meter were placed at the receptor (day or night) at the time the HST actually passes?

The subject of noise analysis is very complex and the public and other important stakeholders can easily be confused by difficult and complicated presentations. However, the realities of project-related impacts are not lessened by obfuscation.

The following comments illustrate problems with the RDEIR/EIS noise impact analysis. While the comments focus on the receptors at and around Mercy Hospital, the concern extends to all similarly situated urban receptors.

L005-93

76. The Noise Impact Analysis underestimates impacts by using an artificially inflated noise baseline. The conversion of a 60-minute measurement (a single hour worth of data) gathered during the daytime period near a sensitive receptor at a noise level of 58 dBA misadjusted using the formulae for presenting 24-hour empirical and modeled Leq data assumes that noise at 58 dBA is occurring during every hour for any 24-hour cycle giving a false impression that the existing background should be 64 dB every hour, day and night against which the increment is weighed during periods when this is not the case.] This approach is inappropriate in the context that the speed limit along Truxtun Avenue at the hospital is 30 miles per hour and night-time traffic is less than 100 vehicles per hour. Furthermore, the speed limits in the residential areas directly adjacent to the HST easement along Truxtun Avenue are also 30 miles per hour. The chart below underscores some of the problems contained in the analysis as presented. The HST analysis assumes that the soundscape in the near-HST area ranges between 65 dBA to 70 dBA relying on the Ldn conversion. The reality as shown by the FWA modeling for traffic during each hour shows the true soundscape to be substantially quieter (i.e., 35 dBA(1h) to 62 dBA (1h)). The difference between the increment and the existing soundscape is 30 dBA at night and in the morning; this translates to an energy differential of 1000 times. The same overstatement (of background condition by extrapolating one-hour data to 24 hours) holds true for all urban area short-term manipulations.



The intent of the Ldn and CNEL data is to provide a conservative analysis of incremental impacts above actual background to an affected receptor.

The noise impact analysis wrongly uses Ldn or CNEL as a means of establishing background levels to adjust the quiet background soundscape noise levels upward,

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often through use of a 1-hour based estimated average, which is corrected to 24 hours into which up to 10 dB are added to hourly background noise at night, resulting in a false numerical value that is several orders of magnitude higher than the actual noise (soundscape). In other words, the RDEIR/EIS uses an incorrect baseline for determining whether the project will have a significant impact on noise, which masks the actual impacts, understates the significance of the impacts, and renders the RDEIR/EIS's analysis of noise impact invalid.

Furthermore, the discussion in Section 3.2.1 D. "FTA Guidelines" properly shows that the modeled "[n]oise exposure is in terms of Leq (h) for Category..." Ldn implies a 24-hour cycle for background, not a single hour converted to Ldn. It is important to stress that the Ldn is not the appropriate soundscape value to test project impacts against City's performance-based thresholds for significance. Category 2 refers to residences and buildings where people normally sleep. This category includes homes and hospitals where night-time sensitivity to noise is assumed to be of utmost importance and leaving one to wonder why the RDEIR/EIS improperly uses an estimated Ldn to establish a soundscape value as opposed to an actual value for these receptors.

The correct use of the FTA Chart is as follows:

If the actual receptor background were properly used as Leq (h) for all background analysis, the residential noise levels under "Existing Noise Exposure" would likely be 40 dBA to 50 dBA at night for any hour (h), as this is the typical soundscape range for a residential neighborhood, the Leq (h) would also be reported in this range, and the Ldn would be approximately 56 dBA. At a far-field distance where the HST project incremental noise level was estimated to be 60 dBA Leq, the Category 1 would be designated a Severe Impact (Significant for the RDEIR/EIS) for any receptor with a nighttime soundscape having a Leq(h) of less than 55dBA. Category 3 would experience a Severe Impact for any receptor with a nighttime soundscape having a Leq(h) of less than 40 dBA. However, Category 2 project impacts would be converted to Ldn (66.7 dBA) and applied to the chart showing a Severe Impact to soundscapes where the hourly background Leq(h) is as high as 63 dBA.

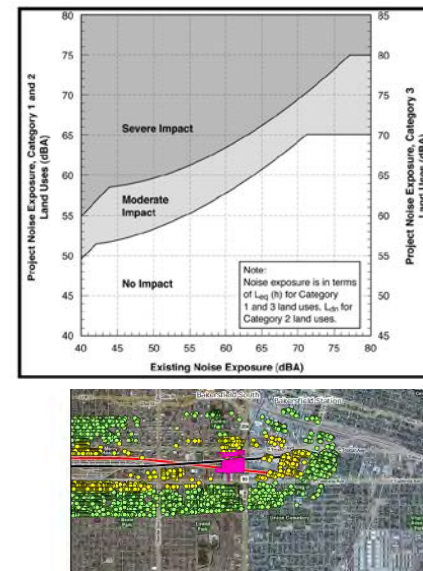
Using the HST impact of 69 dBA Ldn estimated for location the RDEIR/EIS Noise Study receptor location ST195 (1600 Pine Street) coupled with a reasonable background of 50 dB correctly shows a "Severe Impact" in the evening night and morning hours as opposed to the erroneous presentation using a calculated value to present a soundscape having an Ldn of 66.8 dBA which would infer "No Impact".

Further, according to the FTA Guidance, "[t]he measure of noise exposure is Ldn for residential areas and Leq for land uses that do not have nighttime noise sensitivity. Since Ldn and Leq are measures of total acoustic energy, any new noise source in a community will cause an increase, even if the new source level is less than the existing level." [FTA Guidelines, §3.1.2] Therefore, the incremental impact should be considered to determine the severity using Figure 3.2.

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77. The RDEIR/EIS's misapplication of the Ldn reduces the area of actual severe impacts of the HST in critical urban areas. The severity of impacts to all sensitive receptors should be properly shown for both daytime and night-time operations in the context of actual background noise levels and not a misapplied short-term derived Ldn.

The noise generated by the HST train is not a sustained phenomenon. Trains will pass through the corridor at discrete times for short durations. The pulsed disturbance felt at 8 am will not be the same as the effect felt at 8 pm or 2 am (when actual background is lower---not higher). The background should be established for periods in the day based on the character of the noise as measured at the time of the day that the impact creating event occurs. The correct analysis would be to apply the HST related Ldn noise increment to the actual background noise level to reflect the impact to the community at the time an HST train passes.

The HST fails to properly use the FTA guidelines. The correct practice is to establish relevant time periods:

For each of these source types/conditions, decide what are the relevant time periods for all receivers that may be affected by this source. If the source will

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affect residential receivers, two time periods are of interest to compute Ldn: daytime (7 am to 10 pm) and nighttime (10 pm to 7 am). In addition, if the source will affect non-residential receivers, choose the loudest facility hour during noise-sensitive activity. Several different hours may be of interest for non-residential receivers, depending on the hours the facility is used." [emphasis added.] [FTA, Noise and Vibration Guidance Manual].

The use of Ldn for background washes the discrete data into a poorly defined overstated average that hides an important time-dependent impact to sensitive receptors (homes, hospitals and schools) in the evening and night an impact that could be profound, adverse and unhealthy.] At a minimum, the daytime hourly background estimate measurement should have 2dBA subtracted from the value in accordance with FTA guidelines. The RDEIR/EIS must be revised and recirculated to address the new and more severe noise impacts that would be disclosed when the analysis is performed properly.

L005-95

78. Table D-2 and D-3 Noise Technical Study – Empirical data do not support HST noise data estimates for background levels in the City. The background noise levels in the RDEIR/EIS are inflated, resulting in underestimated Section impacts.

Data locations were audited by randomly selecting several sites where HST data were gathered in the City to test the veracity of the claimed data. The data gathered in the proximity to the rail yard (at the police yard directly adjacent to the tracks) (100 feet from the tracks and 20 feet from H Street) showed an Ldn of 68.3 dBA. Yet the HST (ST-1) data shows that Bakersfield High School (BHS) has an Ldn of 69 dBA (where the center of Campus is 600 feet away from the rail yard and separated by buildings from both California Street and the Rail yard). The increment study by the HST showed that BHS had a background of 70dBA Ldn (not 69 dBA Ldn), presumably preferring the use of the higher value gathered from HST (LT188) data at 2009 California Avenue directly adjacent to California Avenue. Allowing for a reduction of 6 dBA per distance doubled from the rail yard (per HST noise Study), the noise level would be expected to be roughly 58 dBA (ignoring any attenuation by buildings). [Both ST1 and LT188 were positioned to maximize noise gathered by the rail system and not to gather representative samples of the school related background noise.]

Start Time	Friday, August 17, 2012 16:29:17				
Stop Time	Saturday, August 18, 2012 15:17:02				
User Name					
General Data Panel					
Description	Measr	Value	Description	Measr	Value
Noise	1	0 %	Pdise	1	0 %
Leq	1	30.8 dB	Lmin	1	30.8 dB
Lmax	1	82.1 dB	Lpk	1	100.3 dB
TWA	1	35.9 dB	Rtime	1	1.014745
OL%	1	0 %	CNEL	1	58.4 dB
ULtime	1	00:00:00	Tact	1	53 dB
SEL	1	80.5 dB	ExpSec	1	0 Pa2-Sec
LDN	1	58.1 dB	UR%	1	0 %
Modine	1	8/18/2012 3:33:47 AM	Modine	1	8/17/2012
PRtime	1	8/17/2012 11:21:13 PM	Projected TWA	1	58.8 dB
Dose48	1	0 %	ExpHrs	1	0.00 Pa2-
Hours					

L005-95

As another example, Beale Park's 24 hour data gathered by the City's consultant showed 56.1 dBA Ldn, yet the short term converted HST (ST 193) data used to analyze the Section's impacts showed the Beale Park residential area background noise at a much higher 66.8 dBA Ldn. This inflated baseline tends to reduce disclosure of the Section's significant noise impacts.

Start Time	Friday, August 17, 2012 18:29:17				
Stop Time	Saturday, August 18, 2012 15:17:02				
User Name					
General Data Panel					
Description	Measr	Value	Description	Measr	Value
Noise	1	0 %	Pdise	1	0 %
Leq	1	30.8 dB	Lmin	1	39.3 dB
Lmax	1	82.1 dB	Lpk	1	100.3 dB
TWA	1	35.9 dB	Rtime	1	1.014745
OL%	1	0 %	CNEL	1	58.4 dB
ULtime	1	00:00:00	Tact	1	53 dB
SEL	1	80.5 dB	ExpSec	1	0 Pa2-Sec
LDN	1	58.1 dB	UR%	1	0 %
Modine	1	8/18/2012 3:33:47 AM	Modine	1	8/17/2012
PRtime	1	8/17/2012 11:21:13 PM	Projected TWA	1	58.8 dB
Dose48	1	0 %	ExpHrs	1	0.00 Pa2-
Hours					

L005-96

79. Section 3.4 - The RDEIR/EIS is inadequate in its portrayal of the Bakersfield Metropolitan Noise Element criteria.

The discussion in the Noise and Vibration Technical Study focuses on the Metropolitan Bakersfield General Plan (MBGP) Noise Element criteria addressing nuisance activities. These criteria rely on L50(h) and/or CNEL. Again, it is important to establish the background CNEL on actual data and not based on a single daytime hour's measurement that is extrapolated. The maximum noise level shall not exceed 60 dBA CNEL at any residence (this is inclusive of the noise increment as well as background).

Using a simple addition of two similar noise levels to achieve 60 dBA CNEL, results in the increment for the project-related impact of 57 dBA CNEL, or roughly a modeled HST impact of 50 dBA Leq (calculated by backing out the 5 and 10 dBA additions for certain hours). One can easily contour the project related impact level of 50 dBA Leq from the HST source as a point or linear source depending on distance from the source to the receptor. Using 6 dBA reduction per distance doubled [ignoring the more conservative 3 dBA] the ST 164 value of 62 dBA Ldn at 1357 feet, and converting the Ldn back to Leq, (i.e., 56 dBA Leq) one can now establish that the distance to the contour line representing the MBGP.] Threshold exceeding value of 50 dBA Leq is between 2600 feet (point source) [and 5200 feet (line source)], thereby extending the severe impacts well beyond the depiction provided in the RDEIR/EIS even when using the less protective 6 dBA per distance doubled. In fact, this indicates that the entire area depicted below in green (as one example) should be considered as severely impacted and the RDEIR/EIS should properly reflect the greater severity of impacts.

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L005-96



L005-97

80. Section 3.4, Noise and Vibration Technical Report - The RDEIR/EIS is deficient in that it does not address location-specific phases where the noisiest construction equipment may be operating for sustained periods in areas near sensitive receptors.

Study data for sensitive receptors such as BHS or Mercy Hospital shows little relevant construction noise impact-related information. Appendix I, of the Noise and Vibration Technical Report for the HST RDEIR/EIS shows little information that reveals the impact of demolition- and foundation-related construction.

Bakersfield has a unique urban setting. The city center through which the alternative Section alignments are proposed has a dense mix of residential (single- and multiple dwellings) as well as hospitals, churches and schools. Heavy earthmoving equipment, jackhammers and pile drivers will be necessary to ensure that the elevated rail system is suitably constructed for Seismic Zone 4 requirements. Schools must remain in operation to provide services to students. Construction within the urban area will present the City's schools with difficult decisions related to ensuring that the City's students are not forced to accept substandard education due to the selection of a route through the dense city center.

The presence of HST-related high-noise-impact-generating activities coupled with sensitive receptors must be considered in the RDEIR/EIS to adequately inform decision makers not familiar with Bakersfield's unique urban setting. Bakersfield ordinances have special provisions for such activities; see previous discussion concerning the MBGP Noise Element.

L005-97

Mitigation for construction noise should include a requirement to adhere to the City's noise requirements and restrictions on construction activities in and around school areas to weekends and near all other sensitive receptors to weekdays and daytime hours only.

L005-98

81. Section 3.4 and Technical Report - The RDEIR/EIS does not present an adequate analysis of the physiological effects of the HSR noise in terms of unique frequency bands.

Certain frequencies will travel through ground and past acoustic barriers. Resonance of certain frequencies in architectural features such as windows, doors and walls will create episodic nuisance affecting sensitive receptors.

Educators have expressed concern regarding the effect of certain noise sources on learning. As an example, BHS is an inner city school, which has a responsibility for educating students with learning difficulties whose parents are living at subsistence levels. Many of those students are also learning in an English-as-a-second-language (ESL) context. Teachers will be faced with additional challenges as trains pass directly adjacent to the historic inner city education facility 180 times a day (assuming a daytime skew) once every ten or fifteen minutes during classes.

The RDEIR/EIS must be revised to study the psychological effects of noise on BHS receptors as well as all other sensitive receptors within the City.

L005-99

**UTILITIES AND ENERGY**

82. Because air emissions and energy usage are closely related, an inadequate analysis of energy necessarily leads to inadequate analysis of the air related impacts.

- a. The Authority and FRA have not adequately considered the Section's and Project's energy demands and therefore the related air quality impacts of the HST. The Project, if completed as planned, would consume approximately 1% of the electric energy generated in California. As such, the Authority must conduct a realistic study of how the increased demand would affect an already taxed electrical system. Yet, it has not completed this necessary study and instead relies upon perfunctory analysis based on unsupported assumptions.
- b. "APPENDIX 3.6-A EXISTING PLUS PROJECT CONDITIONS ENERGY ANALYSIS" is less than five pages long and cites to a letter study APPENDIX 3.6-C "ENERGY ANALYSIS MEMORANDUM" that is 4 pages long. Unsupported statements to the effect that the Project will use Renewable Energy and regenerative braking are not adequate. Impact studies to sensitive receptors from actual HST owned local electricity generation (which will be needed to stabilize the transient prone HST substations) are missing in the REIR/EIS.
- c. The RDEIR/EIS must carefully consider and present the energy related impacts. Full disclosure is required. The analysis must address likely scenarios such as (1) a condition where the RPS is either consumed by the HST and the ratepayers are forced to pay ever increasing rates to subsidize riders, or (2) project-specific

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- L005-99 generation units are required (as vaguely identified on site plans but not analyzed at actual utilization levels).
- d. The use of daily averages and indefinite sources of electrical generation for the project increment produce the false impression of surplus renewable resources with existing capability to meet the future reliability requirements during all hours of Project activity including peak hours, as well as ready access to renewable energy that is not already rate based. These claims are not supported by studies. State and regional energy regulatory bodies have expressed concern about future energy resource adequacy for reliability and reserve capacity.
- e. Additionally, the RDEIR/EIS presents a picture to the layperson that the location of generating facilities is unknowable—this is false. The Authority must study and disclose in a revised RDEIR/EIS the most likely locations of generating facilities needed to meet the Project's incremental power requirements accounting for the regional demand at each hour especially during peak periods.
- L005-100 **BIOLOGY**
83. The general description of Biological Resources focuses on species, not location. It is difficult to determine which species are impacted by location. There are species located in Fresno and other areas that are not present in Bakersfield and vice-versa. The overall generalization does not adequately describe the impacts on biological resources by location and what specific mitigation measure applies. The lack of location-specific information results from the dearth of surveys conducted to establish baseline information for the Section's impacts to biological resources.
- L005-101 84. The Biological Resources mitigation measure section uses the word "could," not "shall" or "must," under implementation. This implies the mitigation measure is optional (example: Section 3.7.6) and therefore unenforceable and ineffective, in violation of CEQA's fundamental requirements. This is characteristic of mitigation throughout the document. The language of the mitigation measures recommended in the RDEIR/EIS must be revised to provide that their implementation would be mandatory if the Section is approved. See CEQA Guidelines § 15126.4(a)(2); *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1116.
- L005-102 85. In Section 3.7.2.4, the description of the Metropolitan Bakersfield Habitat Conservation Plan (MBHCP) should state the permit expires in August 2014. An application for extension of the permit has been submitted.
- L005-103 86. There is no direct discussion as to what permits are required by/from the US Fish and Wildlife Service (USFW) and California Department of Fish and Game (CDFG). What other Federal and/or State permits are required to implement the project? Pages 3.7-3 through 5 list applicable laws and regulations but doesn't specify how they will be applied to HSR.
- L005-104 87. All three of the proposed alignments cross through the Kern River linkage, an important wildlife crossing area. As described in Section 3.7 Biological Resources and Wetlands, impacts to wildlife movement through the corridor would be blocked by

- L005-104 fencing during construction activities. This would result in a moderate effect under NEPA and a significant effect under CEQA.
- L005-105 88. The RDEIR/EIS should include additional mitigation measures to reduce the impacts to wildlife movement. The Westside Parkway (now under construction) utilizes minimal amounts of fencing. Where fencing is required, it is restricted to areas designated for construction staging and areas where public safety is an issue. The Westside Parkway has also installed large culverts with protective gratings at known wildlife crossings to allow wildlife to freely cross under the freeway. Construction fencing for the Section should be similarly restricted to areas where construction would pose general safety hazards. The mitigation measures employed on the Westside Parkway project are feasible, would reduce or avoid the potential impacts, and can be incorporated into the proposed project. Please discuss these additional mitigation measures and either recommend their adoption or explain why they are not selected. CEQA Guidelines § 15126.4(a)(1)(B).
- L005-106 89. The HSR intends to prepare and implement a Habitat Mitigation and Monitoring Plan (HMMP) to mitigate for temporary and permanent impacts on jurisdictional waters and state streambeds (Bio-MM#62) but the requirement for an HMMP ignores other types of upland habitats. The Westside Parkway is required to provide compensatory mitigation for sensitive species – specifically, it requires protection of species habitat outside of the Kern River using the MBHCP on a fee-per-acre basis. The fee is based on pre-negotiated compensation ratios for impacts (permanent versus temporary) and habitat types (disturbed/ruderal, non-native grassland, saltbush scrub, and riparian). The mitigation ratios vary from 4:1 for permanent impacts to non-native grassland to as low as 1:1 for temporary impacts to disturbed/ruderal areas. For riparian habitat within the Kern River streambed, the Westside Parkway is required to mitigate at 4:1 using the Kern Water Bank Authority lands. The mitigation measures employed on the Westside Parkway project are feasible, would reduce or avoid the potential impacts, and can be incorporated into the proposed project. Please discuss these additional mitigation measures and either recommend their adoption or explain why they are not selected. CEQA Guidelines § 15126.4(a)(1)(B).
- L005-107 **SAFETY**
90. Page 3.11-30 discusses train derailment and how physical elements such as containment parapets, check rails, guard rails, and derailment walls would be used in specific areas with high risk of or high impact from derailment. However, the RDEIR/EIS fails to identify where these high risk/high impact areas are located or explain the criteria used to identify these areas. The project design features beginning on page 3.11-37 do not specifically identify whether these physical features are or are not incorporated into the track design and where they occur.
- L005-108 91. On page 3.11-41 regarding hazards of flooding, there is no mention that Isabella Dam is under the authority of the US Army Corp of Engineers or that Isabella reservoir has limited capacity because the dam is in need of repair and upgrade. Furthermore, the RDEIR/EIS does not state whether the project complies with the 2009 Lake Isabella Dam Failure Evacuation Plan and does not address the potential impact of flooding affecting the HSR and piers that support the elevated portions of the track.

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- L005-109 | 92. There is no discussion regarding the possibility of terrorist activities that could occur along any portion of the elevated track through the city. It was stated that this is a remote possibility, but we do not know if this is the author's unsupported opinion or is a conclusion based on facts and analysis. CEQA requires the RDEIR/EIS to state the facts which support this and all other assertions.
- L005-110 | 93. The analysis concerning public safety fails to address the potential for train collisions and does not verify and substantiate the effectiveness of physical barriers to prevent derailments. How likely would the physical barriers be able to contain a head-on collision at over 200 mph, especially on the elevated section of track? What would happen if the physical barriers failed to contain the trains involved in a head-on collision? What about the impacts at grade where no derailment barriers are provided?
- L005-111 | 94. S&S-MM #1 on page 3.11-44 states that there will be payment of an impact fee to local fire, rescue and emergency service providers. This requirement is vague. What is the fee being proposed? How will "fair share" be determined? Will that fee actually pay for anticipated services of the various agencies? CEQA is clear in its requirement that the payment of a fee alone is not sufficient mitigation. (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692.) The RDEIR/EIS also must provide substantial evidence that payment of the impact fee actually will result in avoiding or substantially reducing the potential impact. (Gray v. County of Madera (2008) 167 Cal.App.4th 1099.) In addition, the RDEIR/EIS must identify a plan or program which the public agency is committed to implementing that will use the impact fee to accomplish actual mitigation of the significant impact. (Anderson First Coalition v. City of Anderson (2005) 130 Cal.App.4th 1173.)
- L005-112 | 95. There is no discussion about the electrification of the track and its impact to public safety or wildlife. Furthermore, in an emergency, how is electrification handled and how easily is it turned off so that emergency personnel and injured people will not become electrified, especially if the system does not turn off automatically?
- SOCIOECONOMICS**
- L005-113 | 96. Regarding economic and socioeconomic impacts, the City recognizes that the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and the Fifth Amendment of the United States Constitution are applicable to the project as described on page 3.12-84.
- The impacted development within the City includes several forms of public financial assistance such as HUD entitlement grant funds, redevelopment funds, State of California grants, and tax credits, the loss of which cannot be fully compensated. Removal of the housing prior to the periods of affordability as required for such funding sources (in many cases, up to 55 years of affordability) would likely result in significant repayment penalties to the developers and the City above and beyond fair market value of any such property, yielding potentially significant economic impacts.
- In addition, replacement of 160 low-, moderate- and middle-income (LMMI, earning < 120% Area Median Income) units, and relocation of approximately 450 LMMI residents

- L005-113 | is problematic when assessing the number of current vacant affordable units available in the Bakersfield market and the number of desirable sites for replacement units which would provide similar proximity to services and transportation.
- L005-114 | 97. In Section 3.12.8 (CEQA Significance Conclusions), Impacts SO-2 and SO-3, the division of existing communities in northeast and northwest Bakersfield is identified as being a significant impact after mitigation. As stated previously, a CEQA alternative which bypasses existing Bakersfield communities must be included as part of the RDEIR/EIS analysis as a means to avoid or reduce significant environmental effects, including but not limited to Impacts SO-2 and SO-3. Another potential alternative which could avoid or reduce Impacts SO-2 and SO-3 is a below-grade system through established Bakersfield communities. Both alternatives would avoid or substantially reduce unmitigated significant impacts to noise and land use and, absent substantial evidence of infeasibility, must be analyzed in the RDEIR/EIS.
- L005-115 | 98. Because a significant number of businesses will be required to be relocated, the RDEIR/EIS should identify specific relocation mitigation, including but not limited to, assisting businesses through the permitting process at their new site and ensuring that infrastructure necessary for a business is in place, entitlements exist for the business, and additional funds above and beyond the typical relocation process are available to address the hardships encountered with a move, including loan assistance and resulting business closure or bankruptcy. Absent such assistance, the recommended mitigation would be only partially effective at best. In addition, the RDEIR/EIS must disclose whether affected businesses will be allowed to continue operating at their present location until a new location, with all entitlements and improvements necessary for immediate resumption of business operations, is secured.
- L005-116 | 99. All three alternative alignments through the City will adversely impact a number of City facilities, including but not limited to, the City's Corporation Yard, Police Service Center, Communications Facility, City Hall South parking lot, McMurtry Aquatic/Ice Center, and the Rabobank Arena & Convention Center parking lot. The corporation yard houses a number of facilities that are an integral part of the City's operations. Any disruption to these operations will negatively impact the City's ability to provide essential services to the citizens of Bakersfield, i.e. police, fire, refuse collection, etc. The City has previously voiced its concerns about these impacts to the Authority, but the RDEIR/EIS preparers appear to have ignored them. As such the RDEIR/EIS is inadequate and misleading.
- L005-117 | 100. The RDEIR/EIS does not address impacts to the Rabobank Arena/Convention parking lots. The Rabobank Arena/Convention Center is the largest venue in the southern San Joaquin Valley. These parking lots are necessary to accommodate large events than can number over 10,000 attendees. It is typical for these large events to book several months or more in advance. However, the RDEIR/EIS does not address either the temporary or permanent impacts or how this will affect events already booked. If the City cannot guarantee sufficient parking for these events, they will go elsewhere. In addition to the impacts on public parking, loss of these events would potentially cost the City millions in direct revenue, sales tax, and occupancy tax, which would have adverse indirect effects on public services and public safety. The RDEIR/EIS improperly defers identification of necessary mitigation as stating that the Authority will work with the City to resolve the impacts. This is not adequate CEQA mitigation.

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- L005-118 | 101. East Bakersfield is not the only environmental justice area that the rail will impact. Similar housing areas exist in the downtown area along California Avenue and Truxtun Avenue, and in the northwest area along Glenn Street, Enger Street, Jewetta Avenue and Verdugo Lane. Additionally, BHS is considered an inner-city school. Each of these areas must be considered in the environmental justice and socioeconomic analyses. The revised analysis must consider the impacts to religious institutions located in areas affected by alternative alignments. (See CEQA Guidelines, § 15131(b).)
- L005-119 | 102. All of the proposed alternatives impact economically disadvantaged neighborhoods throughout the metropolitan area. However, there is no discussion as to the outreach efforts to residents of these neighborhoods. It is unclear whether these residents understand the impacts to their homes and businesses. The apparent lack of outreach appears to violate the Authority's recently adopted Environmental Justice Policy and Guidance (approved August 2, 2012).
- L005-120 | 103. The RDEIR/EIS is silent with respect to the Bakersfield Hybrid Alignment's proposed removal of the Bakersfield Homeless Shelter along East Truxtun Avenue. The socioeconomic impacts stemming from the loss of this resource must be fully considered in a revised RDEIR/EIS and mitigated. Relocation of this facility will be difficult so that it can maintain their current level of service.
- L005-121 | 104. The RDEIR/EIS does not conduct an adequate Environmental Justice Analysis for the City. A realistic review of the socioeconomic impacts of the significantly impacted citizens shows that the HST impacts are most heavily affect low income minority populations in the disadvantaged portions of the southern San Joaquin Valley. The schools along the route through the city are inner city schools with high minority populations. A proper alternative reflecting consideration of the affected disadvantaged population is needed to ensure adequate protection. A clear analysis of the disproportionate impacts would reveal the difficulty imposed on already stressed families by forced relocations, disruptive noise and adverse health impacts.
- LAND USE**
- L005-122 | 105. The RDEIR/EIS is overly optimistic in its consideration of economic impacts – it assumes with little supporting evidence that the proposed project will substantially increase economic opportunities in the vicinity of the Bakersfield HST station, based on ridership projections for the full state-wide system. More specifically, the RDEIR/EIS states on page 3.13-51 that impacts are less than significant because "indirect effects on surrounding land uses would be beneficial, encouraging more-efficient land use patterns that are in agreement with Bakersfield planning goals." However, due to projected HST costs and existing funding shortfalls for the HST system, the feasibility of constructing such a system beyond the segments described in the Merced-Fresno EIS and Fresno-Bakersfield RDEIR/EIS is highly questionable. Thus, ridership projections beyond the scope of the Merced-Bakersfield route are highly speculative and inappropriate for forming conclusions regarding economic impacts to a station area. Even if the Project were fully funded, the Authority's optimistic ridership forecasts are based on questionable assumptions and are likely inflated.

- L005-123 | 106. According to Appendix 3.1-A of the RDEIR/EIS, all affordable housing in South Mill Creek will be permanently impacted by the project. On page 3.13-51 (Station Planning, Land Use, and Development), the document acknowledges that the City has adopted redevelopment plans in the vicinity of Bakersfield's proposed HST station. The document, though, does not adequately recognize direct impacts to the 160 units of South Mill Creek affordable housing, nor does the RDEIR/EIS accurately address the indirect economic impact on the redevelopment project as a whole, including the potential impacts associated with urban decay that may occur. [See *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184.]
- L005-124 | 107. On page 3.13-13, the following Metropolitan Bakersfield General Plan implementation measure is referenced: "Local agencies should cooperate in studies to pursue establishment of high-speed rail service for the plan area, including consensus on potential routes and terminal locations." What the RDEIR/EIS fails to note, however, is that the Authority has ignored or disregarded concerns raised by City staff with respect to impacts to established communities, businesses, institutions, and vital governmental facilities in response to proposed HST alignment plans. Instead, the RDEIR/EIS contains generalized, unsubstantiated conclusions to justify that the benefits of the HST system to the State of California and to the environment would greatly outweigh any adverse impacts which might result at the local level.
- In accordance with CEQA, the purpose of an RDEIR/EIS is to disclose to the public and to decision makers the potentially significant environmental effects of a project and to identify ways in which such effects can be avoided or reduced. Justifying the overriding benefits of a project relative to its environmental effects is not one of the roles of an RDEIR/EIS; rather, in accordance with State CEQA Guidelines Section 15093 a statement of overriding considerations supported by evidence in the record must be made by a decision-making body at the time they approve a project for which an RDEIR/EIS identifies unmitigated environmental effects. (See *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866.)
- L005-125 | 108. Section 3.13.47, Station Planning, Land Use and Development -- the document mentions that 4,500 parking spaces would be provided in one or two structures, depending on the alternative site chosen. The RDEIR/EIS has added new information that increases the station parking need to 8,100 spaces by 2035. However, there is no indication of how this figure was derived and that this amount of parking is actually necessary. The discussion notes that a parking evaluation would be coordinated with the City at some future date to examine underutilized parking in the area, some of which would be privately owned. We fail to see how the Authority can assume that they will be able to have this additional parking available for their use in the future since these private property owners may need this parking for their own businesses. In addition, the RDEIR/EIS's proposal for the Authority to coordinate with the City on some unspecified mitigation at some unspecified time in the future constitutes an improper deferral of mitigation in violation of CEQA.
- L005-126 | 109. Page 3.13-12 states that the HSR would be located on lands designated as high and low density commercial and industrial. It is unclear if the RDEIR/EIS is identifying this as existing policy or if the Authority believes the HSR has been limited to these areas. This statement is misleading. It fails to identify that the HSR will also be located over

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L005-126	residential, open space and recreation lands and as such, is inconsistent with the City's General Plan and will result in significant adverse impacts on land use and planning.	L005-130	113. In Section 3.13.5.3, the RDEIR/EIS notes that the effects from the conversion of land for the Section's alignment, HST stations and HMF during construction are considered negligible under NEPA and land use impacts from construction are considered less than significant under CEQA. We disagree. There is nothing in the RDEIR/EIS to explain how these determinations were made. For example, the temporary impacts upon the convention center parking and loading areas would be significant as these disruptions would affect the ability of the City to attract or possibly retain events, thereby reducing income to support the facility. This is one of many instances where it is very unclear in the RDEIR/EIS what the impacts are to these properties and how the Authority intends to address them. The lack of facts or other data to support the assumptions and conclusions in the RDEIR/EIS renders it inadequate and incomplete. ( <i>Communities for a Better Environment v. City of Richmond</i> (2010) 184 Cal.App.4th 70.)
L005-127	110. On page 3.13-13, Implementation Measure 10 of the City's General Plan is referenced in a discussion concerning the cooperation that local agencies should offer to pursue the establishment of high-speed rail service for the plan area, including consensus on potential routes and terminal locations. Although the City has had numerous meetings with the Authority, the Authority has never worked with the City to alter routes or explore alternatives to address impacts on City resources or other public facilities. Issues brought forward by staff such as the project's significant adverse impacts on BHS, Mercy Hospital, East Bakersfield, the convention center, and current road construction projects were never resolved. The Authority, although invited numerous times to address the Planning Commission and City Council to provide public dialog, never accepted. Instead, the Authority has decided to defer its obligations to consult with the City to the RDEIR/EIS comment and response process rather than have open and honest discussions with stakeholders and the public concerning the project.  Although the new Bakersfield Hybrid alternative addresses a few of the concerns, albeit late, all of the alternatives are too close together to be viewed as an actual "reasonable range of alternatives" under CEQA, and all still negatively impact the community.	L005-131	114. CEQA expressly requires an EIR to evaluate whether a proposed project will physically divide an established community. (CEQA Guidelines, Appendix G, X. Land Use. (a)). However, there is no discussion in the RDEIR/EIS of the permanent division of the community that will occur.  a. The rail will create a significant barrier. What happens under the elevated portion of the track? Will it be fenced? What uses would be permitted underneath these areas? The RDEIR/EIS discusses possible uses in these areas, but it is not sufficiently specific and there is no commitment by the Authority to ensure these areas do not become barriers to surrounding communities or magnets for blight, crime and vandalism.  b. We understand that the City of Fresno already has experienced urban decay impacts under overpasses in its urban area. Bakersfield Police and Code Enforcement have also experienced similar urban decay issues under existing overpasses in Bakersfield. This Section's resulting division of communities may impact neighborhoods and business areas to the degree that they could become undesirable, unattractive, and eventually abandoned, resulting in urban decay. Remnant parcels too small to be used for any development could become attractive nuisances and could be used for illegal dumping of debris or vandalism. What if the Authority acquires developed land but leaves empty buildings for years before the project is actually built, or the project stalls permanently? This would of course increase the amount of urban decay in the area. The RDEIR/EIS needs to analyze whether the project will cause or contribute to urban decay impacts. ( <i>Bakersfield Citizens for Local Control v. City of Bakersfield</i> (2004) 127 Cal.App.4th 1184.)
L005-128	111. Page 3.13-17 states that station alternatives have been planned in collaboration with cities. What the statement fails to acknowledge is that because the alternative rail alignments were already established by the Authority without seeking any initial input from the City, the proposed station locations were largely predetermined. Few details were ever provided for analysis by City staff. Stations were always conceptually shown making it difficult to adequately determine the compatibility with local land use plans, goals and policies. Actual rail route footprints and rights-of-way were never provided until the release of the environmental document.		
L005-129	112. Under the no project alternative there is a statement that communities may not attract transit oriented development (TOD) without the HSR, provided there is a station. This is not true.  a. Within the City, active TOD-type projects both exist and are underway. The proposed HSR will actually remove an important new TOD (Mill Creek) and negatively impact the economic viability of the remaining development.  b. The RDEIR/EIS should acknowledge that the City's current General Plan encourages mixed use and infill development. Although the HSR Project is noted in the General Plan, it is not a critical element in the eventual development of mixed use or TOD projects within the City.  c. The RDEIR/EIS fails to disclose and analyze the project's significant impacts on existing and planned TOD projects in the City.	L005-132	115. One of the assumed benefits of the project is that it will reduce air travel trips. However, the RDEIR/EIS fails to disclose and discuss the potential adverse impacts on existing air transportation services serving local communities, such as Meadows Field in Bakersfield. There is no mention of the impact to these other transportation land uses and supporting businesses or the extent of the reduction in air travel which is expected to result from the Project. CEQA clearly requires an EIR to provide sufficient detail in its analysis to determine the extent of these potential indirect impacts. ( <i>Galante Vineyards v. Monterey Peninsula Water Mgmt. District</i> (1997) 60 Cal.App.4th 1109, 1123.) Could the reduction of demand for these regional airports result in reduced

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L005-132

service and/or closure of Meadows Field and other regional airports, and contribute to urban decay in and around these areas?

L005-133

**PARKS**

116. In Section 3.15 Parks, Recreation, and Open Space, page 3.15-21, the discussion for the Kern River Parkway addresses in a general manner the effects of construction activities and the creation of noise and visual changes. The analysis is inadequate and incomplete because it does not address the effects of operational noise from trains operating overhead on an elevated track and the effect on the recreational use of adjacent parks, bikeways and hiking trails. The visual change with the introduction of an elevated rail system is expected to be dramatic (see Figure 3.16-27) and not negligible as concluded on page 3.15-30.

L005-134

**AESTHETICS AND VISUAL**

117. Section 3.16.1, Paragraph 3. The discussion indicates that "...HST would have low potential to result in visual impacts on aesthetic and visual resources in the Central Valley..." It does not seem accurate to indicate that the design of all alternatives include an approximately 50' - 80' tall elevated structure bisecting the entire core of the City of Bakersfield, has a low potential for visual impact on the existing viewscape throughout the City. That structure will become the predominate visual feature of the City, visible from every part of the City. The presence of the existing transportation corridor has no relationship to the visual effect of these alternatives. Additionally, because of the elevation of the rail, all of the station alternatives will include an elevated platform for loading and unloading passengers, an overall, the scale and mass of the station (any alternative), will be completely out of scale and character of the area.

L005-135

118. Page 3.16.2, Section 3.16.2.3, Paragraph 1. "Consideration of local community design guidelines...subsequent phase of analysis for project-specific environmental review...". This would seem to be deferring discussion of applicable mitigation measures to a future date. How is the City to make an informed comment on mitigation measures at this time if specific information is not available now? "Consideration" is certainly not the same as "implementation" or "adherence to where feasible".

L005-136

119. Aesthetics and Visual Resources VO-MM#3 only requires HRS designers to "consider" local jurisdiction input. This is not adequate mitigation under CEQA since it provides no specific performance standards and does not demonstrate that the measure would reduce the stated impacts. Furthermore, it defers determinations to a later time, which is inconsistent with CEQA.

L005-137

120. The mitigation measures have been completely reformatted and numbered from the prior DEIR for the Section, making it impossible to compare the changes made in the RDEIR/EIS. However the following comments are still relevant:
- a. The mitigation does not specify the extent of the "financial compensation" for park land replacement. The RDEIR/EIS and mitigation measures need to identify which parks are removed and how much park land will be acquired.

L005-137

- b. Mitigation states that trees and landscaping will be planted to visually screen the HRS. There is no identification of when or where the planting would occur, no responsible party for maintenance, and no funding mechanism for on-going replacement and operations (watering, trimming and replacement). As a result, the proposed mitigation is incomplete, ineffective and illusory.
- c. Many impacts identified in Table 3.16-5 remain significant even after mitigation. These impacts would result from the need to construct elevated guideways and noise walls where the HST traverses urbanized areas in Bakersfield and other communities. As stated previously, a CEQA alternative which bypasses existing urbanized areas must be included as part of the EIR analysis as a means to avoid or reduce significant environmental effects, including but not limited to visual quality impacts. Another potential alternative which could avoid or reduce visual quality impacts is a below-grade system through urbanized areas. Both alternatives would avoid or substantially reduce unmitigated significant impacts to visual impacts, noise, and land use. Absent substantial evidence of infeasibility, these alternatives must be analyzed in the RDEIR/EIS.

L005-138

**CULTURAL**

121. Page 3.17-47, Table 3.17-7, Significant Historic Architectural Resources by Alternative, does not identify SR-204 or Union Avenue as an historic resource. In August 2010, the Department of Transportation (Caltrans) prepared a Historical Resources Compliance Report (HRCR) for the Relinquishment of State Route 204. Caltrans determined that SR 204 (Historic US 99) from Airport Drive and SR 99 to Brundage Lane meets the National Register of Historic Places (NRHP) criteria. The California State Historic Preservation officer (SHPO) concurred with Caltrans' determination and agreed to add SR 204 to the Master List of State-owned Historical Resources. Impacts to SR 204 may require additional mitigation subject to SHPO approval. The RDEIR/EIS's failure to analyze the potential impacts of the proposed project on these historical resources renders it inadequate and incomplete. [See *Madera Oversight Coalition v. County of Madera* (2011) 199 Cal.App.4th 48.]

**REGIONAL GROWTH**

L005-139

122. Table 3.18-2 shows that Bakersfield's annual average growth rate will be 5.9% annually until 2035. This means that the city will increase its population an average of over 20,000 people per year over the next 25 years. This is grossly in error. City projections only show a population in the mid-400,000 range in 2035 with an average growth rate of between 1.5 and 2.5% per year. Even during the boom years in the early to mid-2000's, the City never achieved the projected growth rate stated in this table. If these figures were used to estimate future housing growth and in turn, potential ridership, then any assumptions that relied on those numbers are incorrect. A number of experts have disputed the Authority's projections and provided detailed factual and other data which shows that the Authority's projections regarding financial feasibility of the Project and its anticipated economic benefits, including job creation and ridership, are vastly overstated and not supported by the evidence. Newspaper articles and other publications discussing these expert reports and providing the web addresses, at which the reports are available, are included with these comments as [Attachment 3](#).

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123. Under the No Project alternative, HSR is not a critical element for the City to meet its land use goals. The City's General Plan describes the HST Project as a potential component of the transportation system, but the City's goals are not dependent upon the Project being developed. Furthermore, the assumption that, under the No Project alternative, cities will have a difficult time reducing low-density development is not based on fact. With or without the HSR, TOD, mixed-use and high density housing will continue to be encouraged and developed as required by state policy (e.g., SB 375) and as market conditions dictate. Once again, the RDEIR/EIS's assumptions and conclusions are not supported by any facts or other data.

L005-141

124. Beginning on page 3.18-21, the employment tables in the RDEIR/EIS are still inaccurate and may mislead people trying to understand the employment figures. Each year is depicted with employment figures as annual job years. The table concludes the Section construction will generate 7,200 job years (this is the cumulative total over what is now a nine-year construction period) (Incidentally, the analysis does not explain why an additional year was added to the construction period since publication of the first DEIR). However, it should be clear that this is not the total number of jobs. In the narrative that follows, the terms jobs and job years continue to be intermingled, which gives the wrong impression of overall employment. It should be made clear that the number of actual jobs created by the project is much different (lower) than job years. The number of actual jobs should have been provided.

L005-142

125. Again, a number of experts have disputed the Authority's projections and provided detailed factual and other data which shows that the Authority's projections regarding the Project's anticipated economic benefits, including job creation, are vastly overstated and not supported by the evidence. Newspaper articles and other publications discussing these expert reports and providing the web addresses, at which the reports are available, are included with these comments as 3.

L005-143

**CUMULATIVE IMPACTS**

126. While CEQA does not require technical perfection in an EIR, it does require adequacy, completeness, and a good-faith effort at full disclosure. (CEQA Guidelines §150039(i).)

A complete "Corridor" Analysis For the City of Bakersfield should be performed: The City of Bakersfield serves as a juncture for the Fresno to Bakersfield HST Section and the Bakersfield to Palmdale HST Section. A draft EIS/EIR has only been prepared for the Fresno to Bakersfield segment; the Bakersfield to Palmdale segment is anticipated to be complete in 2013 or 2014. Each Section only analyzes a portion of the of the HST corridor through the City, but not all of it. Therefore, impacts are not fully identified for the entire City, nor do we know how the yet unpublished Bakersfield to Palmdale EIR/EIS will be consistent with the Fresno to Bakersfield EIR/EIS. However, the City is not physically divided into two sections, nor is the commercial and industrial business community along the HST corridor. The City is a single jurisdiction wherein property and sales taxes are applied throughout the community. As a practical matter, the split analysis used by a published draft EIS/EIR and a yet unpublished draft EIS/EIR has the effect of assessing only a divided portion of the community, including the significant number commercial and industrial business community located along the HST corridor artificially reducing the significance of impacts and results in less effective mitigation

L005-143

measures. For example, the total number of displaced commercial and industrial businesses within the City is not assessed by either EIS/EIR. In fact, without the Bakersfield to Palmdale DEIR not even completed, we cannot assess any cumulative effects of the HSR project. This information might be capable of being derived by reviewing the details of supporting technical studies, but these are not available through the entire portion of the City. To ensure the EIS/EIRs adequately assess the full impacts of the project, the City recommends Section 3.12 and 3.19 of the EIS/EIR be updated to include a unified and complete analysis of the of the entire portion of the HST corridor within the jurisdiction and sphere of influence of the City of Bakersfield, and to present the summary of those findings and analysis in a clear and readily assessable manner.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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Progress Report on Implementation of  
PM2.5 State Implementation Plans (SIP)  
for the  
South Coast and San Joaquin Valley Air Basins  
  
and  
  
Proposed SIP Revisions

Release Date: March 29, 2011  
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This document has been prepared by the staff of the California Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board.

**California Environmental Protection Agency**



*Air Resources Board*

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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APPENDIX F: Revisions to 2007 PM2.5 and Ozone State Implementation  
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2011

APPENDIX G: Analysis of Environmental Impacts

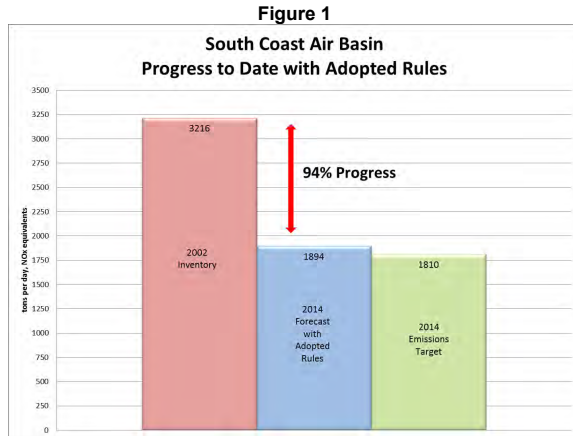
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**California Is Meeting Its Clean Air Commitments for 2014**

For several years, California has been implementing PM2.5 (fine particulate matter) State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins. As required by the federal Clean Air Act (Act), these SIPs show how California plans to attain the annual PM2.5 standard by the 2014 deadline, with specific emission targets for each region. With a few years remaining until the attainment deadline, California is meeting the commitments identified in the PM2.5 SIPs, and air quality continues to improve.

Figures 1 and 2 illustrate California's progress with rulemaking completed to date and the last three years of SIP implementation remaining. The San Joaquin Valley meets, and the South Coast is 94 percent of the way towards achieving the 2014 emissions levels identified in their respective PM2.5 SIPs.

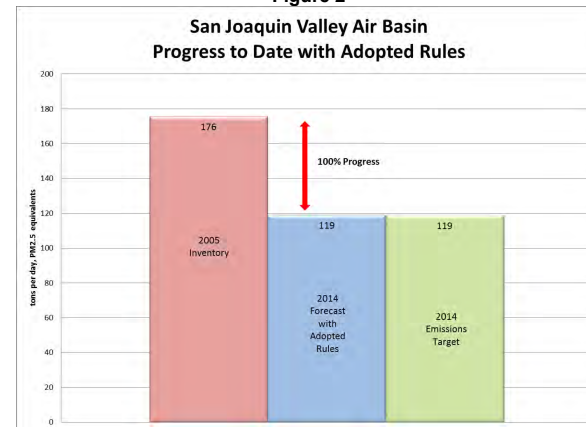
In 2010, the Air Resources Board (ARB) revisited key regulations to account for the lower emission levels resulting from the economic downturn and provided some economic relief to affected industries while maintaining the 2014 emissions target. This is reflected in Figures 1 and 2.



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**Figure 2**



**The Clean Air Act Set a Process to Develop and Implement SIPs**

California's primary responsibility under the Clean Air Act is clear – to develop and implement air quality plans to attain the National Ambient Air Quality Standards (NAAQS) by the required deadlines. The Act mandates a specific process for developing and implementing the SIPs necessary for demonstrating how the NAAQS will be attained. The Act specifies processes for federal sanctions if states fail to develop or to implement required SIPs and requires states to prepare additional SIP revisions if a standard is not met by the deadline.

In California, ARB and the local air districts develop and adopt SIPs based on the best scientific data available at the time. The SIP development process takes 2-3 years, and involves emissions and air quality data gathering and analysis, air quality modeling and documentation, control strategy development, transportation conformity budget development, reasonable further progress analyses, and a comprehensive public process before the plan is ready for consideration and approval by local districts and ARB. Adding to the complexity, the State and local portions must be woven together to reflect the respective regulatory responsibilities.

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Key to this process, and a defining component of the State's SIP commitment, is the air quality modeling results that identify the level of emissions needed in the attainment year to achieve the federal standard. Air quality modeling is an analytical tool that is used to test a scenario of future emissions, and the associated impact on air quality, in order to identify a target level of emissions expected to result in attainment. The SIP is then designed to meet this emissions target. The modeling also provides data which informs the selection of the most effective control strategy.

After adoption, ARB submits the SIP to U.S. EPA for review and approval. The work of implementation then begins, focused on achieving the SIP target level of emissions by the required deadline. Once the plan is adopted, emissions accounting is the appropriate tool to track progress, address any shortfalls, and ensure the State is meeting the legal commitments contained in the plan.

In the case where a region fails to attain a federal standard by the attainment deadline, Section 110 of the Act sets out a separate, sequential process that would require U.S. EPA to direct the state to develop a new SIP with a new attainment deadline.

The Act's step-wise approach of attainment planning, SIP implementation, and monitoring attainment status avoids forcing states into a perpetual planning process. Instead, the Act directs most of the effort towards achieving attainment through rule adoption and SIP implementation. New plans come into play only when an air quality standard is not met by the applicable deadline.

### U.S. EPA Can Now Approve the PM2.5 SIPs for the South Coast and the San Joaquin Valley

California is following the SIP development and implementation process mandated by the Act, despite the delay in federal action on the PM2.5 SIPs for the South Coast and San Joaquin Valley. Implementation and tracking of SIP commitments began immediately upon State approval of the PM2.5 SIPs. This progress report documents both the regulatory and air quality progress that has been made in the South Coast and San Joaquin Valley since the PM2.5 plans were adopted in 2007 and 2008 respectively.

This report also provides targeted revisions to the South Coast and San Joaquin Valley PM2.5 SIPs due to recent revisions to ARB's rules affecting in-use trucks and buses and off-road construction equipment. These SIP revisions are limited to an updated calendar of ARB rulemaking, updates to the Reasonable Further Progress tables and associated reductions for contingency purposes, and adjustments to the transportation conformity budgets.

In a separate action on March 4, 2011, the South Coast adopted revisions to their PM2.5 and Ozone SIP for the South Coast Air Basin and Coachella Valley. These revisions are contained in Appendix F. They update the implementation status of the

district's control measures to meet the PM2.5 attainment date, revise the control measure adoption schedule, and modify the District's emissions reduction commitment to reflect improvements to the off-road emissions estimates for 2014.

Together, these submittals should provide what U.S. EPA needs to fully approve the PM2.5 plans for the South Coast and San Joaquin Valley.

### ARB's Clean Air Commitment is Enforceable

While California's emissions levels have in some cases declined substantially since 2007 as a result of the economic recession, ARB continues to fully implement the PM2.5 SIPs.

When ARB adopted the 2007 State Strategy as a SIP revision, the State of California made a legal commitment, required by the Clean Air Act and enforceable in federal court, to reduce emissions to the levels necessary for attainment. ARB specifically identified several ways this emission reduction commitment could be achieved:

- New measures as described in the SIP
- Other alternative measures that ARB had not considered at the time the SIP was adopted
- Incentive programs that support the replacement or retrofit of aging, higher polluting pieces of equipment
- Actual emission decreases

As a result of the recession, actual emission decreases moved California closer to the emissions levels needed for attainment in 2014. The recession has reduced economic activity and emissions, most notably in the goods movement sector. This has allowed ARB to maintain the State's SIP commitments in the South Coast and San Joaquin Valley while also providing some near-term economic relief to affected industries.

As the economy recovers, ARB will continue to track emission trends to ensure the 2014 emission targets are met. If future emissions were to exceed the SIP target, the State's commitment could be made up with additional controls, incentive programs, or other programs to bring emissions down to the necessary levels. A discussion of how ARB accounted for the recession is found later in this report.

State law<sup>1</sup> assigns ARB the primary responsibility to ensure California's compliance with the federal Clean Air Act. Traditionally, ARB shares that responsibility with local air districts through defined SIP commitments at both the State and local level. In the case of the PM2.5 SIP, there is also an expectation on the part of the State that the federal government provide additional emission reductions based on the U.S. EPA's authority to regulate locomotives and other national sources of air pollution.

<sup>1</sup> California Health and Safety Code section 39003.

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However, if there is a shortfall in a SIP due to lack of federal action, California will be required to achieve additional emission reductions. For example, the SIP for the South Coast calls for reductions of 10 tons per day of oxides of nitrogen (NOx) from sources U.S. EPA or other federal agencies regulate. If the federal government does not provide the expected emission reductions, ARB still has the obligation that the emissions targets specified in the SIP are met by the required deadline.

### The Technical Foundation for the PM2.5 SIPs is Sound

ARB exercised its responsibility at the time of SIP development, public review, and Board adoption, to ensure that the PM2.5 attainment demonstrations met all applicable Clean Air Act requirements, used the best information available at the time, and identified a path to attainment that is technically achievable. ARB's SIP commitment to reduce emissions to the levels necessary for PM2.5 attainment relies on the strong scientific foundation provided in the SIPs for both the South Coast Air Basin and the San Joaquin Valley.

In a recent court decision<sup>2</sup>, the Court called upon U.S. EPA to exercise its affirmative duty to ensure the State's plan is adequate for attainment of the applicable federal standard. Given the strong science supporting California's PM2.5 SIPs, U.S. EPA's assessment of SIP adequacy should focus on the State's demonstrated progress in implementing the adopted plan and achieving real world reductions in air pollution. Adopted SIPs should not be set aside unless there is compelling scientific evidence that the adopted attainment demonstration is substantially flawed, taking into account the unavoidable uncertainties in emission estimates, air quality modeling, and other technical elements.

In the case of the PM2.5 SIPs for the South Coast Air Basin and San Joaquin Valley, there has been no significant change to the fundamental science and air quality modeling used to set the 2014 emissions targets. The SIP modeling remains in accordance with U.S. EPA requirements and should be approved by U.S. EPA. Similarly, the overall control strategy is unchanged and in the process of being implemented. Initiating new air quality modeling to reassess the existing attainment demonstration would serve no practical purpose. The biggest change since the PM2.5 SIPs were adopted is the unanticipated slowdown in economic growth and what it means for PM2.5 precursor emissions in 2014. An emissions accounting that incorporates the impacts of the recession, future emission changes, and the benefits of new SIP measures is the appropriate approach to assess the adequacy of the PM2.5 SIPs now close to final implementation.

<sup>2</sup> U. S. Court of Appeals for the Ninth Circuit in Association of Irrigated Residents, et al. v. U.S. EPA, filed February 2, 2011.

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Development and adoption of the PM2.5 SIPs in the South Coast and San Joaquin Valley followed the mandated process, and resulted in a resource-intensive, 3-year technical effort with a public process that stretched over a year. The end result is a plan whose technical underpinnings remain sound even as new information has become available during SIP implementation. While new emission forecasts are included in the accounting for progress towards the 2014 emissions target, the target itself should not change.

Air quality modeling is an analytical tool that is used to test a scenario of future emissions, and the associated impact on air quality, in order to identify a target level of emissions expected to result in attainment of an air quality standard. The air quality modeling contained in the PM2.5 SIPs is built on the results of the multimillion dollar air quality studies conducted in central California, including the \$50 million California Regional Particulate Air Quality Study (CRPAQS) and the Central California Ozone Study (CCOS).

The ability of an air quality model to predict the attainment year emission targets relies on adequate model performance in the base year. Small changes in base year emissions would not substantially change the fundamental relationship between emissions and measured air quality in the base year modeling. The recession does not impact the SIP base year modeling since both regions used base years prior to the recession. The new emissions inventory data primarily impact current emissions and estimates of future emissions as the economy recovers and do not substantially change the total regional emissions in the base years. Therefore, the air quality modeling and the 2014 emissions targets should be approved by U.S. EPA.

California's development and implementation of the PM2.5 SIPs in the South Coast and San Joaquin Valley illustrates the process mandated by the Act to reach attainment in 2014. In developing and then adopting the 2007 and 2008 PM2.5 SIPs for the South Coast and San Joaquin Valley, the ARB and local air districts provided a technically complete attainment plan. Once the plans were adopted, California's focus appropriately turned to SIP implementation. For its part, U.S. EPA's sulfur in marine fuels rule has also advanced PM2.5 reductions in the South Coast. The SIP technical foundation meets U.S. EPA requirements, control measures are being implemented, and progress is being made. As a result, a modeling update at this juncture is neither necessary nor appropriate.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**ARB Is Implementing Its Rulemaking Calendar**

A key component of SIP implementation is the rulemaking calendar. ARB adopted a SIP revision (the 2007 State Strategy) that mapped out the actions it would take to reduce PM<sub>2.5</sub> direct and precursor emissions to levels designed to bring California nonattainment areas into compliance with federal health-based air quality standards. ARB had initiated rule development for several measures even before the Board adopted the State Strategy in late 2007. This work continues, with several State and local district measures scheduled for adoption between now and 2014. The respective air district plans provide information about the local efforts to adopt and implement local control measures. Table 1 provides an update on the status of SIP measures in the 2007 State Strategy.

The 2007 State Strategy identifies a comprehensive set of State control strategies that support attainment through a combination of technologically feasible, cost-effective, and far reaching measures. ARB actions to date, together with rules adopted by the South Coast and San Joaquin Valley air districts, will bring the two regions within 94 percent and 100 percent of the emission levels needed to reach attainment in 2014 in the South Coast and San Joaquin Valley, respectively. Some of the most important adopted State regulations include:

- Cleanup of the existing truck fleet statewide
- Repowering or replacing older, dirtier off-road construction vehicles, and installing exhaust retrofits
- Lower sulfur limits on fuels used by ships in California waters
- Control of emissions from goods movement sources
- Smog Check improvements

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**Table 1**  
**Proposed Update to 2007 State Strategy: PM<sub>2.5</sub> SIP Measures**

		Agency	Actions	Implementation
<b>Passenger Vehicles</b>				
Smog Check Improvements	BAR	2007-2009	2008-2010; 2013 <sup>1</sup>	
Expanded Vehicle Retirement (AB 118)	ARB/BAR	2007	2009	
Modifications to Reformulated Gasoline Program	ARB	2007	2010	
<b>Trucks</b>				
Cleaner In-Use Heavy-Duty Trucks	ARB	2007, 2008, 2010	2011-2015	
<b>Goods Movement Sources</b>				
Auxiliary Ship Engine Cold Ironing & Other Clean Tech	EPA/ARB/ Local	2007, 2008	2010	
Cleaner Main Ship Engines and Fuel <sup>2</sup>		Fuel: 2008-2011 Engines: 2008	2009-2015 2011	
Port Truck Modernization	ARB, Local	2007, 2008, 2010	2008-2020	
Accelerated Intro. of Cleaner Line-Haul Locomotives <sup>3</sup>	EPA/ARB	2008	2012	
Clean Up Existing Harbor Craft	ARB	2007, 2010	2009-2018	
<b>Off-Road Equipment</b>				
Cleaner In-Use Off-Road Equipment <sup>4</sup>	ARB	2007, 2010	2009	
<b>Other Off-Road Sources</b>				
New Emission Standards for Recreational Boats <sup>5</sup>	ARB	See notes	See notes	
Expanded Off-Road Recreational Vehicle Emission Standards <sup>5</sup>	ARB	See notes	See notes	
Enhanced Vapor Recovery for Above-Ground Storage Tanks	ARB	2008	2009-2016	
Additional Evaporative Emission Standards <sup>5</sup>		2009	2010-2012	
		See notes	See notes	
<b>Areawide Sources</b>				
Consumer Products Program	ARB	2008	2010	
		2009	2013-2014	
		2011	2014	
Pesticide Regulation	DPR	2008, 2009	2009	

<sup>1</sup>In 2010, the State Legislature improved the effectiveness of the Smog Check program (AB 2289), requiring the Bureau of Automotive Repair to direct older vehicles to high performing auto technicians and test stations for inspection and certification. This new program will be effective in 2013.

<sup>2</sup>In July 2008, ARB adopted a regulation that applies to ships operating within 24 nautical miles (nm) of the California Coastline and visiting California ports. These vessels must use less polluting marine distillate fuel for their main engines, auxiliary engines, and boilers instead of heavy fuel oil. The first phase of cleaner fuel for ship main engines took effect in 2009, with a second phase currently scheduled in 2012. By 2015, the International Maritime Organization's fuel sulfur requirements for the North American Emission Control Area will match ARB's phase 2 standards and extend out to 200 miles from California Coastline.

<sup>3</sup>In 2008, ARB awarded Prop 1B bond funds to upgrade line-haul locomotive engines not already accounted for by enforceable agreements with the railroads. Those cleaner line-hauls will begin operation by 2012.

<sup>4</sup>Reductions begin in 2014.

<sup>5</sup>Expected action in 2013, with implementation schedules to be determined in rulemaking process.

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## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Tables 2 and 3 show the progress towards meeting the State's enforceable SIP commitment in each region. The tables include the benefits of local and State controls for each PM2.5 precursor pollutant. To maintain consistency with how each air district displays progress in their documents, the South Coast table is displayed in equivalents of nitrogen oxides (NOx), while the San Joaquin Valley table is in PM2.5 equivalents. NOx and PM2.5 equivalent emissions are calculated using weighting factors from the SIP technical analyses to arithmetically combine the precursor pollutants that form PM2.5. The factors are necessary since the relative effectiveness of each pollutant in reducing atmospheric PM2.5 varies by pollutant and region. From a technical perspective, it does not matter which pollutant is used as the equivalence benchmark to illustrate progress since the same scientific data is applied regardless of how equivalency is expressed.

**Table 2**  
**South Coast Air Basin**  
**Progress to Date with Adopted Rules**

<i>annual average tons per day</i>					
	SOx	PM2.5	ROG	NOx	NOx eq.
2002 Inventory	53	99	844	1093	3216
2014 Emissions Target	20	86	474	460	1810
2014 Forecast with Adopted Rules	20	87	485	530	1894
% progress	100%	92%	97%	89%	94%

**Table 3**  
**San Joaquin Valley Air Basin**  
**Progress to Date with Adopted Rules**

<i>annual average tons per day</i>				
	SOx	PM2.5	NOx	PM2.5 eq.
2005 Inventory	26	86	575	176
2014 SIP Emissions Target	24	63	291	119
2014 Forecast with Adopted Rules	21	65	298	119
% progress	201%	90%	98%	100%

**ARB Accounts for the Impact of the Recession on Goods Movement**

The recession has imposed significant downward pressure on economic activity in the State. In order to meet their bottom line and maximize production output, many businesses have cut back debt, reduced employment, extended workforce hours, and sold assets, including part of their motor vehicle fleets. In some sectors, these adjustments resulting from the recession are expected to continue for some time, extending beyond the 2014 attainment date.

Two of the sectors hit the hardest by the recession are the construction industry and goods movement, including the trucking and shipping industries. These impacts, as well as recovery scenarios, were reflected in ARB's 2010 amendments to the statewide truck and construction regulations and are reflected in the goods movement categories included in this report. The one exception is the locomotive emissions estimate. ARB staff is still in the process of incorporating the latest information on locomotive activity into programs for reducing regional emissions and localized impacts.

In the 2010 assessment of the impacts of the recession, ARB staff evaluated a variety of sources of information including economic forecasts, fuel tax reports, highway performance monitoring data, equipment financial filing records, and vehicle sales information. The data indicated the recession impacted mobile sources in three ways. First, the recession reduced vehicle activity. Overall, trucking activity in California, measured by fuel usage, decreased by nearly 20 percent between 2007 and 2010. Construction-related activity declined by 50 percent between 2005 and 2010. These declines were dramatic, and in many cases unprecedented.

Second, the depth of the recession, being much more severe than economic recessions of the past 70 years, affected the forecast rate of future economic growth. Several economic forecasting groups including the University of California – Los Angeles, the University of the Pacific, and the California Department of Finance forecast that economic recovery and expansion, and rising employment levels will occur relatively slowly over the next five years. ARB used these estimates to reduce its forecasted vehicle activity levels from previously anticipated levels.

Third, the recession had a major impact on new vehicle sales, which in many cases fell by 80-90 percent from the peak levels seen in 2005-2007. Sales volumes are projected to increase gradually, and are not forecast to reach previous levels for several years. This has also reduced the penetration of the newest, cleanest vehicles into the California market, leaving fleets older than they would have been without the recession.

This economic outlook was used in the 2010 review of the statewide on-road truck rules, and resulted in a 2010 emissions inventory that is about 35 percent lower than estimated when the original rules were adopted in 2008. Similarly, the updated off-road inventory calculated during development of the construction rule is about 80 percent lower than previously estimated, with half the change attributable to the recession and half attributable to new emissions data and analysis.

When ARB revised the statewide truck and off-road fleet rules in 2010, the new inventory projections were used to design the timetable and regulatory provisions in such a way that emission benefits are preserved as economic growth picks up and full rule implementation phases in. The revised rules provide credits for fleets that have downsized to account for the recession, while allowing for a delay of additional capital investments until 2016. The rules provide incentives for early vehicle retrofit and turnover to achieve emissions reductions necessary for 2014, while offering some

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

economic relief. The revised rules will still provide the emissions reductions necessary to meet air quality standards, but do so at a lower cost. Concurrently, ARB retained and expanded the benefits of the drayage truck rule to protect communities near ports and rail yards.

The improvements would not significantly change the inventories for trucks, construction equipment, and ocean going vessels in years prior to the recession. The changes are small in the context of the entire emissions inventory, consequently the total regional SIP base year inventories need not be changed. The new information indicates that the 2014 economic activity estimates made prior to the recession are too high. Looking forward, revised economic activity forecasts and improvements to future emission estimates from these source categories are reflected in the emissions accounting to assess progress toward the SIP commitments, in the updated RFP demonstration, and in new conformity budget calculations.

### Air Quality Continues to Improve

As a result of SIP implementation efforts at the local and State level, air quality is improving in both the South Coast and San Joaquin Valley regions.

The South Coast has seen dramatic improvement in PM2.5 air quality, with a 37 percent decrease in the basin-wide annual average design value over the last eight years. This decrease has occurred despite the inclusion of a new high site monitor in Mira Loma (Riverside County) in 2006. Based on data in 2009, sites outside the Riverside area already meet or are close to meeting the annual standard. While final South Coast data for 2010 are not yet available, indications are that concentrations have continued to further decline and that only the site at Mira Loma now exceeds the annual standard.

The San Joaquin Valley has also experienced an improvement in PM2.5 air quality, although the progress is not as uniform across the region. The biggest decreases occurred in the northern and central part of the Valley where the design values for various monitors decreased 25 to 37 percent between 2001 and 2010. Today, sites in the northern and central Valley meet or are close to meeting the annual standard. The southern San Joaquin Valley, which includes the Bakersfield area, has also shown improvement, with annual design values decreasing 10 to 20 percent.

Air quality design values reflect a three-year average which is used for comparison to federal standards. However, evaluating multiple measures of air quality can provide a broader picture of overall air quality progress. For example, individual year annual PM2.5 values for 2009 and 2010 throughout the Valley show significant improvement. In 2010, only two of the twelve sites in the Valley (Corcoran and Bakersfield) recorded annual concentrations that exceed the federal air quality standard. Peak 24-hour PM2.5 concentrations have also declined significantly, dropping over 30 percent since 2001. The Air Quality Index (AQI) is another measure that is used to evaluate daily air quality

conditions. Between 2001 and 2010, the number of days considered unhealthy under the AQI has been cut in half.

### California Is Moving Forward

California has made tremendous progress in cleaning the air over the past several decades, providing environmental leadership and meeting Clean Air Act requirements. As California's PM2.5 SIPs are being implemented to meet a 2014 deadline, additional SIPs will need to be developed for other air quality standards. ARB is working with local air districts to develop new SIPs in 2012 that are required to address the daily 24-hour PM2.5 federal air quality standard by 2017. U.S. EPA's anticipated promulgation of a more stringent ozone standard will trigger a new round of SIPs with attainment deadlines well beyond 2020. As these efforts proceed, ARB will use the most recent emissions inventory data from category-specific rules, refine existing inventory models, and conduct additional air quality modeling.

As required by the federal Clean Air Act, the South Coast and San Joaquin Valley PM2.5 SIPs show how California plans to attain the annual PM2.5 standard by the 2014 deadline, with specific emission targets for each region. With three years remaining until the attainment deadline, California is meeting the commitments identified in the PM2.5 SIPs, and air quality continues to improve. With California's progress on rulemaking the San Joaquin Valley meets, and the South Coast is 94 percent of the way towards achieving the emissions levels identified in their respective PM2.5 SIPs for attainment in 2014. The SIPs' technical foundation is sound, control measures are being implemented, and progress is being made. The targeted revisions to the South Coast and San Joaquin Valley PM2.5 SIPs should provide what U.S. EPA needs to fully approve the PM2.5 plans for the South Coast and San Joaquin Valley.

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South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

**APPENDICIES**

**APPENDIX A: Descriptions of the Proposed SIP Revisions**

Updates to ARB's Rulemaking Calendar

ARB staff is proposing updates to ARB's Rulemaking Calendar to reflect the current status of adopted PM2.5 measures and changes to expected action dates for three of these measures: new emission standards for recreational boats, expanded off-road recreational vehicle emission standards, and additional evaporative emission standards. ARB proposes to modify the action date for all three measures from the existing range of 2009-2010 to 2013. ARB action on these measures in this timeframe will allow implementation to occur by the 2014 attainment date. ARB's commitments to achieve emission reductions by specified dates, as identified in the 2007 State Strategy, remain unchanged and are not altered by the proposed changes to ARB's rulemaking calendar. Appendix B provides the PM2.5 SIP revision for the updated rulemaking calendar.

Reasonable Further Progress

The federal Clean Air Act (Act) requires that SIPs show there will be steady progress in reducing emissions during the years leading to the attainment date, called reasonable further progress (RFP). ARB staff is proposing updates to the RFP tables to reflect the current status of adopted measures and account for changes due to the recession. These revisions are necessary to reflect current forecasted emissions as a result of the impacts of the recession on key source categories in the SIPs. Appendix C provides the SIP revision for the updated RFP tables.

The Act also requires attainment plans to identify "contingency measures" to be implemented if nonattainment areas fail to meet RFP requirements or to attain the federal air quality standards on time. These contingency measures are to take effect without further ARB or air district action, and thus must be measures that have already been adopted when the SIP is submitted to U.S. EPA.

For PM2.5, U.S. EPA requires that the RFP plan show generally linear progress for the precursor pollutants identified in the attainment demonstration. For the San Joaquin Valley this includes direct PM2.5, NOx, and SOx. For the South Coast Air Basin it also includes ROG. Since both the San Joaquin Valley and South Coast Air Basin show attainment in 2014, 2009 and 2012 are the milestone years for RFP. ARB is providing contingency measures for the 2012 RFP milestone and 2014 attainment years as appropriate.

ARB is updating the RFP milestone emission levels to reflect the impact of the recession and recent changes to the in-use heavy-duty truck and off-road equipment

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Appendix A

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rules, and also the ocean-going vessels rule for the South Coast. Appendix C Tables 1 and 2 display projected emission levels in each of the RFP years, showing continuous progress towards the attainment levels for the San Joaquin Valley and the South Coast Air Basin, respectively. The RFP levels in both areas meet U.S. EPA requirements for demonstrating generally linear progress.

For the San Joaquin Valley, the estimates of emission levels in the RFP milestone years consider baseline emissions and emission reductions accomplished by District adopted rules. Approximately one year's worth of RFP reductions are reserved from existing emission reductions for contingency purposes for NOx and SOx in 2012. For PM2.5, SOx reductions that are in excess of those needed to meet RFP and contingency are reserved for PM2.5 contingency purposes.

For the South Coast, emission estimates for the milestone years considered baseline emissions, emission reductions from ARB adopted rules, and emission reductions accomplished by District adopted rules. All existing emission reductions are credited towards meeting the RFP milestones, with no reductions withheld for contingency purposes. This is appropriate given recent air quality progress in the South Coast.

For the 2014 attainment year, the additional emission reductions accrued in 2015 from baseline emission reductions are relied upon to meet the contingency requirements for both the San Joaquin Valley and the South Coast.

### Updates to the Transportation Conformity Budgets

ARB is proposing to update the transportation conformity budgets applicable to the federal annual PM2.5 standard for the South Coast and San Joaquin Valley and establish a trading mechanism that will ensure that the impact of on-road emissions will be consistent with the attainment demonstration in future years. The basis for the trading mechanism is the SIP attainment modeling which established the relative contribution of each PM2.5 precursor pollutant. These updates account for the action taken by the Board in December to amend the truck and bus regulations to include better data and improvements to the emissions inventory, and reflects the current rulemaking calendar. Appendix D provides the SIP revision and description of the trading mechanism.

The Act requires metropolitan planning organizations (MPO) to demonstrate that their regional transportation plans (RTP) and transportation improvement programs (TIP) are consistent with progress toward and attainment of the NAAQS. MPOs use modeling to estimate regional emissions based on projected motor vehicle travel on the region's road and transit facilities.

The level of emissions for on-road motor vehicles, such as cars, trucks, and buses, consistent with SIP progress and attainment, is called a "motor vehicle emissions

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budget." For conformity, projected emissions from highway and transit use must be less than or equal to the budget. Budgets are developed during the air quality planning process in consultation with ARB, regional air districts, U.S. EPA, the U.S. Department of Transportation, and MPOs and provide for public review and comment.

The conformity budgets use the SIP on-road mobile source inventory which includes an updated heavy duty diesel truck and bus inventory that reflects the 2010 truck and bus regulatory amendments. This adjustment reflects the difference between the baseline SIP on-road motor vehicle emissions inventory from EMFAC2007 and the new truck and bus inventory that incorporates the impacts of both the recession and final regulations. The ton per day change in emissions is incorporated as a line item adjustment to the updated transportation conformity budgets (see "State Strategy Adjustments" line item in Tables A-1 and A-2 below).

Methodologically, the State Strategy Adjustments line item is then subtracted from the baseline SIP on-road motor vehicle emissions inventory from EMFAC2007. Importantly, the SIP baseline emissions inventory continues to be based on the activity data (e.g. vehicle miles travelled) provided by the SIPs.

This line item approach to account for State strategy reductions is consistent with the approach used to develop the originally submitted budgets. Following is an example of how the line item adjustment is calculated and used to develop the conformity budgets.

This example reflects the derivation of the 2014 NOx budget for South Coast Air Basin.

- The combined NOx emissions from medium and heavy heavy-duty trucks, school buses and other buses are retrieved from the baseline EMFAC2007 SIPs inventory (145 tpd NOx) and the new truck inventory (132 tpd NOx).
- The difference between these emissions is calculated (145 tpd – 132 tpd = 13 tpd NOx).
- 13 tpd NOx reflects the difference between the SIPs baseline inventory and the new truck inventory.
- 13 tpd is then added to the emission reductions in CY 2014 that were already identified in the SIPs from State and local strategies, including: Smog Check improvements and AB 923 Light and Medium-Duty High-Emitter Identification programs (13 tpd + 0.7 tpd = 13.7 tpd NOx)
- 13.7 tpd NOx is the total "State Strategy Adjustments" and is then entered into the conformity worksheet

The transportation conformity budget development worksheets are included in Tables A-1 and A-2 below, with the proposed SIPs budgets found in Appendix D.

Note that the "Adjustments to Baseline" line item originally included benefits for adopted regulations for solid waste collection and public fleet vehicles, heavy duty chip re-flash, and heavy duty truck idling, since the impacts of these regulations were not included in EMFAC2007. The benefits of these regulations are now reflected in the new truck and bus inventory baseline, and, therefore, are no longer included as a line item adjustment.

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Appendix A

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The remaining "Adjustments to Baseline" consist of reductions from AB 1493 (Pavley) and benefits from the on-road portion of the Carl Moyer program.

**Table A-1**  
**South Coast Air Basin**  
**PM2.5 Transportation Conformity Emission Budget Worksheets\***  
(Annual Average – Tons per Day)

South Coast Air Basin	2012			2014		
	ROG	NOx	PM2.5	ROG	NOx	PM2.5
Baseline Inventory	162.6	350.8	17.5	146.1	305.7	17.2
Re-entrained Road Dust (Paved)			18.8			19.0
Re-entrained Road Dust (Unpaved)			1.0			1.0
Road Construction Dust			0.2			0.2
State Strategy Adjustments	-3.8	-21.2	-1.2	-9.2	-13.7	-2.7
Adjustments to Baseline	-0.4	-1.2	-0.1	-0.6	-1.3	-0.2
<b>Budget</b>	<b>159</b>	<b>329</b>	<b>37</b>	<b>137</b>	<b>291</b>	<b>35</b>

\*Budgets are rounded up to the nearest ton.

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**Table A-2**  
**San Joaquin Valley Air Basin**  
**PM2.5 Transportation Conformity Emission Budget Worksheets\***  
(Annual Average – Tons per Day)

County		2012		2014	
		PM2.5	NOx	PM2.5	NOx
Fresno	Baseline Inventory	1.82	47.82	1.65	40.6
	State Strategy Adjustments	0.29	11.61	0.54	9.07
	Adjustments to Baseline	0.01	0.35	0.02	0.29
	Budget	1.6	35.9	1.1	31.3
Kern (SJV)	Baseline Inventory	2.98	81.58	2.63	70.28
	State Strategy Adjustments	1.02	31.77	1.42	26.29
	Adjustments to Baseline	0.01	0.57	0.01	0.40
	Budget	2.0	49.3	1.3	43.6
Kings	Baseline Inventory	0.59	16.00	0.51	13.52
	State Strategy Adjustments	0.18	5.33	0.25	4.20
	Adjustments to Baseline	0.00	0.12	0.00	0.09
	Budget	0.5	10.6	0.3	9.3
Madera	Baseline Inventory	0.50	12.30	0.46	10.62
	State Strategy Adjustments	0.10	3.04	0.17	2.55
	Adjustments to Baseline	0.00	0.10	0.01	0.09
	Budget	0.5	9.2	0.3	8.0
Merced	Baseline Inventory	1.19	29.15	1.05	24.67
	State Strategy Adjustments	0.35	9.11	0.49	7.16
	Adjustments to Baseline	0.01	0.23	0.01	0.18
	Budget	0.9	19.9	0.6	17.4
San Joaquin	Baseline Inventory	1.39	35.24	1.29	30.27
	State Strategy Adjustments	0.32	10.51	0.45	8.58
	Adjustments to Baseline	0.01	0.26	0.01	0.20
	Budget	1.1	24.5	0.9	21.5
Stanislaus	Baseline Inventory	0.84	22.25	0.76	18.69
	State Strategy Reductions	0.13	5.42	0.22	4.04
	Adjustments to Baseline	0.00	0.15	0.00	0.10
	Budget	0.8	16.7	0.6	14.6
Tulare	Baseline Inventory	0.75	20.87	0.69	17.88
	State Strategy Adjustments	0.11	5.05	0.20	4.05
	Adjustments to Baseline	0.00	0.16	0.01	0.14
	Budget	0.7	15.7	0.5	13.7

\*Budgets are rounded up to the nearest tenth ton (0.1).

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Appendix A

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Appendix A

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APPENDIX B: Rulemaking Calendar

Table B-1  
Proposed Update to 2007 State Strategy: PM2.5 SIP Measures

	Agency	Actions	Implementation
Passenger Vehicles			
Smog Check Improvements	BAR	2007-2009	2008-2010; 2013 <sup>1</sup>
Expanded Vehicle Retirement (AB 118)	ARB/BAR	2007	2009
Modifications to Reformulated Gasoline Program	ARB	2007	2010
Trucks			
Cleaner In-Use Heavy-Duty Trucks	ARB	2007, 2008, 2010	2011-2015
Goods Movement Sources			
Auxiliary Ship Engine Cold Ironing & Other Clean Tech	EPA/ARB/ Local	2007, 2008	2010
Cleaner Main Ship Engines and Fuel <sup>2</sup>		Fuel: 2008-2011	2009-2015
		Engines: 2008	2011
Port Truck Modernization	ARB, Local	2007,2008, 2010	2008-2020
Accelerated Intro. of Cleaner Line-Haul Locomotives <sup>3</sup>	EPA/ARB	2008	2012
Clean Up Existing Harbor Craft	ARB	2007, 2010	2009-2018
Off-Road Equipment			
Cleaner In-Use Off-Road Equipment <sup>4</sup>	ARB	2007, 2010	2009
Other Off-Road Sources			
New Emission Standards for Recreational Boats <sup>5</sup>	ARB	See notes	See notes
Expanded Off-Road Recreational Vehicle Emission Standards <sup>5</sup>	ARB	See notes	See notes
Enhanced Vapor Recovery for Above-Ground Storage Tanks	ARB	2008	2009-2016
Additional Evaporative Emission Standards <sup>5</sup>		2009	2010-2012
		See notes	See notes
Areawide Sources			
Consumer Products Program	ARB	2008	2010
		2009	2013-2014
		2011	2014
Pesticide Regulation	DPR	2008, 2009	2009

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Appendix B

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<sup>1</sup>In 2010, the State Legislature improved the effectiveness of the Smog Check program (AB 2289), requiring the Bureau of Automotive Repair to direct older vehicles to high performing auto technicians and test stations for inspection and certification. This new program will be effective in 2013.

<sup>2</sup>In July 2008, ARB adopted a regulation that applies to ships operating within 24 nautical miles (nm) of the California Coastline and visiting California ports. These vessels must use less polluting marine distillate fuel for their main engines, auxiliary engines, and boilers instead of heavy fuel oil. The first phase of cleaner fuel for ship main engines took effect in 2009, with a second phase currently scheduled in 2012. By 2015, the International Maritime Organization's fuel sulfur requirements for the North American Emission Control Area will match ARB's phase 2 standards and extend out to 200 miles from California Coastline.

<sup>3</sup>In 2008, ARB awarded Prop 1B bond funds to upgrade line-haul locomotive engines not already accounted for by enforceable agreements with the railroads. Those cleaner line-hauls will begin operation by 2012.

<sup>4</sup>Reductions begin in 2014.

<sup>5</sup>Expected action in 2013, with implementation schedules to be determined in rulemaking process.

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Appendix B

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APPENDIX C: Reasonable Further Progress Tables

Table C-1  
San Joaquin Valley Air Basin  
PM2.5 Reasonable Further Progress

	Direct PM2.5 (annual average, tpd)			
	2005	2009	2012	2014
Linear Benchmark	86	76	68	63
Estimated Emissions	86	73	69	63
Contingency (see SOx)	*NA	NA	0	NA
<b>RFP Level</b>	<b>86</b>	<b>73</b>	<b>69</b>	<b>63</b>

	NOx (annual average, tpd)			
	2005	2009	2012	2014
Linear Benchmark	575	449	354	291
Estimated Emissions	575	381	328	291
Contingency	NA	NA	26	NA
<b>RFP Level</b>	<b>575</b>	<b>381</b>	<b>354</b>	<b>291</b>

	SOx (annual average, tpd)			
	2005	2009	2012	2014
Linear Benchmark	26	25	24	24
Estimated Emissions	26	23	20	21**
Contingency (for SOx and PM2.5)	NA	NA	3	NA
<b>RFP Level</b>	<b>26</b>	<b>23</b>	<b>23</b>	<b>24</b>

\*NA: Not applicable

\*\* Note: As a result of control measures already adopted to date, the 2014 RFP target for SOx has already been surpassed.

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Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

Table C-2  
South Coast Air Basin  
PM2.5 Reasonable Further Progress

	Direct PM2.5 (annual average, tpd)			
	2002	2009	2012	2014
Linear Benchmark	99	91	88	86
Estimated Emissions	99	89	89	86
Contingency	*NA	NA	0	NA
<b>RFP Level</b>	<b>99</b>	<b>89</b>	<b>89</b>	<b>86</b>

	NOx (annual average, tpd)			
	2002	2009	2012	2014
Linear Benchmark	1093	724	566	460
Estimated Emissions	1093	677	582	460
Contingency	NA	NA	0	NA
<b>RFP Level</b>	<b>1093</b>	<b>677</b>	<b>582</b>	<b>460</b>

	ROG (annual average, tpd)			
	2002	2009	2012	2014
Linear Benchmark	844	628	534	474
Estimated Emissions	844	563	514	474
Contingency	NA	NA	0	NA
<b>RFP Level</b>	<b>844</b>	<b>563</b>	<b>514</b>	<b>474</b>

	SOx (annual average, tpd)			
	2002	2009	2012	2014
Linear Benchmark	53	34	26	20
Estimated Emissions	53	43	26	20
Contingency	NA	NA	0	NA
<b>RFP Level</b>	<b>53</b>	<b>43</b>	<b>26</b>	<b>20</b>

\*NA: Not applicable

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the  
South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

**APPENDIX D: Transportation Conformity Budgets**

**Table D-1**  
**South Coast Air Basin**  
**Proposed PM2.5 Transportation Conformity Emission Budgets\***  
(Annual Average – Tons per Day)

	2012			2014		
	ROG	NOx	PM2.5	ROG	NOx	PM2.5
<b>South Coast Air Basin</b>	159	329	37	137	291	35

\*Budgets are rounded up to the nearest ton.

Per Section 93.124 of the conformity regulations, for transportation conformity analyses using these budgets in analysis years beyond 2014, a trading mechanism is established to allow future decreases in NOx emissions from on-road mobile sources to offset any on-road increases in PM2.5, using a NOx:PM2.5 ratio of 10:1. This trading mechanism will only be used, if needed, for conformity analyses for years after 2014. To ensure that the trading mechanism does not impact the ability to meet the NOx budget, the NOx emission reductions available to supplement the PM2.5 budget shall only be those remaining after the 2014 NOx budget has been met. Clear documentation of the calculations used in the trading should be included in the conformity analysis.

In addition, at the time the 2007 SIP was adopted, a 2009 budget year was a necessary MPO analysis year for federal transportation conformity purposes. Since 2009 has passed, it is no longer applicable as a conformity analysis year, and was therefore not included in these budgets.

Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the  
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**Table D-2**  
**San Joaquin Valley Air Basin**  
**Proposed PM2.5 Transportation Conformity Emission Budgets\***  
(Annual Average – Tons per Day)

County	2012		2014	
	PM2.5	NOx	PM2.5	NOx
<i>Fresno</i>	1.6	35.9	1.1	31.3
<i>Kern (SJV)</i>	2.0	49.3	1.3	43.6
<i>Kings</i>	0.5	10.6	0.3	9.3
<i>Madera</i>	0.5	9.2	0.3	8.0
<i>Merced</i>	0.9	19.9	0.6	17.4
<i>San Joaquin</i>	1.1	24.5	0.9	21.5
<i>Stanislaus</i>	0.8	16.7	0.6	14.6
<i>Tulare</i>	0.7	15.7	0.5	13.7

\*Budgets are rounded up to the nearest tenth ton (0.1).

Per Section 93.124 of the conformity regulations, for transportation conformity analyses using these budgets in analysis years beyond 2014, a trading mechanism is established to allow future decreases in NOx emissions from on-road mobile sources to offset any on-road increases in PM2.5, using a NOx:PM2.5 ratio of 9:1. This trading mechanism will only be used, if needed, for conformity analyses for years after 2014. To ensure that the trading mechanism does not impact the ability to meet the NOx budget, the NOx emission reductions available to supplement the PM2.5 budget shall only be those remaining after the 2014 NOx budget has been met. Clear documentation of the calculations used in the trading should be included in the conformity analysis.

In addition, at the time the 2007 SIP was adopted, a 2009 budget year was a necessary MPO analysis year for federal transportation conformity purposes. Since 2009 has passed, it is no longer applicable as a conformity analysis year, and was therefore not included in these budgets.

# Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

## APPENDIX E: Additional Documentation

Appendix E includes additional documentation and data supporting this Progress Report and SIP Revision. It includes additional detail regarding the emissions accounting methodology, supporting data for the progress Tables 2 and 3 found in the body of the report, and information on how ARB staff accounted for the impacts of the recession

### SIP Accounting

The Clean Air Act requires the use of air quality modeling to determine the "carrying capacity" or "SIP emissions target"; that is, the maximum allowable emission levels that the nonattainment area can accommodate while attaining the standard.

While the adopted SIP contains a list of category-specific measures with regulatory timelines and expected reductions, ARB's enforceable commitment is to meet the emissions levels needed for attainment with sufficient aggregate emission reductions, including any from actual changes in emissions.

To track progress toward the emissions target, this report uses a simple emissions accounting approach that explicitly show the impact of the recession and the benefit of the regulations ARB and the local air districts have approved since the PM2.5 SIPs were adopted. The approach looks like

$$(Emissions\ Inventory) - (Emission\ Reductions\ Achieved) = (Remaining\ Emissions)$$

Where:

- Emissions Inventory* = Amount of PM2.5 and PM2.5 precursor emissions the base line
- Emission Reductions Achieved* = Amount of emissions that have been reduce either through adopted regulations or actual emission decreases due to the recession
- Remaining Emissions* = The PM2.5 and PM2.5 precursor emissions level that is forecast to be remaining in the attainment year with the impacts of both regulations and the recession.

This approach keeps the focus on meeting the ultimate goal of the emission target derived from air quality modeling. It also has the advantage of explicitly showing the impacts of both the regulatory actions and the recession that an emissions accounting that looks just at regulatory reductions does not.

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Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

## Progress Details

The following series of tables provide additional documentation for Tables 2 and 3, showing progress to date for both the South Coast and San Joaquin Valley.

**South Coast Air Basin  
2014 Progress to Date on ARB Rules**

	NOx Emissions (tpd)		
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Smog Check Improvements (BAR)	134.2	134.2	131.6
Cleaner In-Use Heavy-Duty Trucks & Buses	136.0	151.2	132.6
Cleaner In-Use Off-Road Equipment (over 25hp)	96.9	28.0	27.5
Ship Auxiliary Engine Cold Ironing & Clean Tech.	37.2	23.7	15.6
Cleaner Main Ship Engines and Fuel - Main Engines	33.4	38.5	20.9
Accelerated Intro. Of Cleaner Line-Haul Locomotives	18.3	18.3	18.3
Clean Up Existing Harbor Craft	15.7	15.2	11.1
Cargo Handling Equipment	5.2	3.2	3.2
New Emission Standards for Recreational Boats	11.0	11.0	11.0
Co-Benefits from Greenhouse Gas Reduction Measures	0.0	0.0	0.0
All other local, state, and federal emissions	165	166	159
<b>Total 2014 forecast with rules adopted to date</b>	<b>653</b>	<b>589</b>	<b>530</b>

**ROG Emissions (tpd)**

	ROG Emissions (tpd)		
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Smog Check Improvements (BAR)	132.1	132.1	123.5
Cleaner In-Use Heavy-Duty Trucks & Buses	10.2	8.7	5.4
Cleaner In-Use Off-Road Equipment (over 25hp)	13.4	2.6	2.5
Ship Auxiliary Engine Cold Ironing & Clean Tech.	0.7	0.9	0.7
Cleaner Main Ship Engines and Fuel - Main Engines	0.2	1.9	1.4
Accelerated Intro. Of Cleaner Line-Haul Locomotives	2.3	2.3	2.3
Clean Up Existing Harbor Craft	0.7	1.2	1.1
Cargo Handling Equipment	0.6	0.3	0.3
New Emission Standards for Recreational Boats	37.9	37.9	37.9
Expanded Off-Road Rec. Vehicle Emission Standards	6.7	6.7	6.7
Consumer Products Program	102.6	102.6	96.7
All other local, state, and federal emissions		221	206
<b>Total 2014 forecast with rules adopted to date</b>		<b>518</b>	<b>485</b>

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PM2.5 Emissions (tpd)			
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Smog Check Improvements (BAR)	7.8	7.8	7.5
Cleaner In-Use Heavy-Duty Trucks & Buses	5.8	6.0	3.4
Cleaner In-Use Off-Road Equipment (over 25hp)	4.9	1.3	1.3
Ship Auxiliary Engine Cold Ironing & Clean Tech.	0.6	0.5	0.4
Cleaner Main Ship Engines and Fuel - Main Engines	2.6	3.9	0.4
Accelerated Intro. Of Cleaner Line-Haul Locomotives	0.7	0.7	0.7
Clean Up Existing Harbor Craft	0.7	0.6	0.4
Cargo Handling Equipment	0.1	0.1	0.1
All other local, state, and federal emissions		74	73
<b>Total 2014 forecast with rules adopted to date</b>		<b>95</b>	<b>87</b>

SOx Emissions (tpd)			
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Cleaner In-Use Heavy-Duty Trucks & Buses	0.3	0.3	0.3
Ship Auxiliary Engine Cold Ironing & Clean Tech.	1.1	1.1	0.8
Cleaner Main Ship Engines and Fuel - Main Engines	20.7	38.7	1.7
All other local, state, and federal emissions		21	17
<b>Total 2014 forecast with rules adopted to date</b>		<b>61</b>	<b>20</b>

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San Joaquin Valley Air Basin  
2014 Progress to Date on ARB Rules

NOx Emissions (tpd)			
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Smog Check Improvements (BAR)	41	41.2	40.5
Cleaner In-Use Heavy-Duty Trucks & Buses	156.9	111.3	110.2
Cleaner In-Use Off-Road Equipment (over 25hp)	31.4	13.7	13.4
Accelerated Intro. Of Cleaner Line-Haul Locomotives	19.9	19.9	19.9
New Emission Standards for Recreational Boats	3.5	3.5	3.5
All other local, state, and federal emissions		123	110
<b>Total 2014 forecast with rules adopted to date</b>		<b>313</b>	<b>298</b>

PM2.5 Emissions (tpd)			
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Smog Check Improvements (BAR)	2.5	2.5	2.4
Cleaner In-Use Heavy-Duty Trucks & Buses	6.2	4.3	2.6
Cleaner In-Use Off-Road Equipment (over 25hp)	1.4	0.6	0.6
Accelerated Intro. Of Cleaner Line-Haul Locomotives	0.5	0.5	0.5
All other local, state, and federal emissions		64	59
<b>Total 2014 forecast with rules adopted to date</b>		<b>72</b>	<b>65</b>

SOx Emissions (tpd)			
	SIP	Current	
	2014 Baseline	New 2014 Baseline	2014 Remaining Emissions
Cleaner In-Use Heavy-Duty Trucks & Buses	0.3	0.2	0.2
Cleaner In-Use Off-Road Equipment (over 25hp)	0.0	0.0	0.0
All other local, state, and federal emissions		24	21
<b>Total 2014 forecast with rules adopted to date</b>		<b>24</b>	<b>21</b>

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## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

### Assessing the Impacts of the Recession on Good Movement Related Emissions

This section documents the methodologies used to account for the impacts of the economic recession on the emission inventories for trucks, in-use off-road equipment, ocean-going vessels, and cargo handling equipment. Links to more detailed information are provided.

#### General Methodology

The economic recession officially started in December of 2007 and ended in June 2009. It was the most severe since the Great Depression and had a severe impact on California industries. The emission inventories for trucks, in-use off-road equipment, ocean-going vessels, and cargo handling equipment have all been adjusted to its impact.

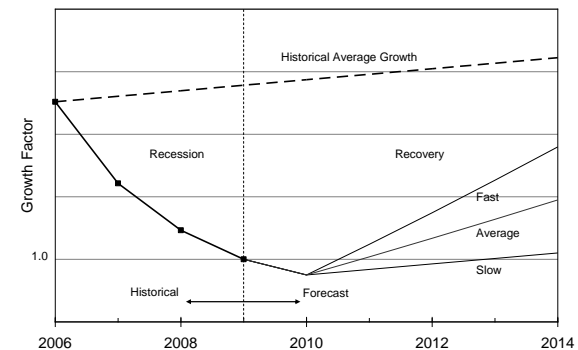
To understand the impact of reduced activity on future emissions, staff developed both a fast and slow recovery scenario to bound the recovery possibilities.

The fast recovery scenario assumes that total activity would return to projected historically average levels in 2017 and then grow at the historical average rate after that. This scenario is based on the Congressional Budget Office forecast which indicated that real gross domestic product at a nationwide level will converge with potential gross domestic product trends no later than 2015. Coupling this forecast with the assumption that California's recovery will lag the nation by several years yielded the 2017 recovery date assumed for the fast recovery scenario.

In the slow recovery scenario, staff assumed that activity would be permanently depressed relative to historical levels, but continue to grow at the average historical growth rate beginning in 2011.

While the fast and slow scenarios provide a reasonable bound of possible recoveries, for rulemaking purposes and for this SIP update, a single forecast is needed. For this, staff assumed an average recovery midway between the fast and slow recoveries. The chart below illustrates the two bounding scenarios and the assumed average used in this report. This is the same approach developed to provide economic relief through last year's regulatory amendments to the diesel trucks, buses, and off-road equipment rules.

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#### In-Use On-Road Trucks & Buses

Staff updated the inventory for diesel trucks and buses to support ARB consideration of regulatory amendments to provide economic relief last December 2010. The update was comprehensive and included a revised population, new regional allocation factors, lifetime odometer assumptions, revised growth rates, forecasted vehicle age distributions to reflect the impact of the economic recession, and updated out-of-state vehicle activity. These changes are described in detail at <http://www.arb.ca.gov/regact/2010/truckbus10/truckbus10.htm>.

This progress report required emission estimates for years and pollutants (SOx and ROG) that were not needed for the 2010 rulemaking. Staff used the same methodologies and principles used for the December 2010 regulatory inventory to develop estimates for the other years and pollutants in this report.

#### In-Use Off-Road Equipment

Just as for trucks and buses, staff completed a comprehensive revision to the inventory for off-road equipment to support ARB consideration in December 2010 of regulatory amendments to provide economic relief. Updates were made to the population of equipment, annual activity, load and future equipment sales. These changes are described in detail at <http://www.arb.ca.gov/regact/2010/offroadlsi10/offroadlsi10.htm>.

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Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

This progress report required emission estimates for years and pollutants (SOx, ROG and total organic gases (TOG)) that were not needed for the 2010 rulemaking. Staff used the same methodologies and principles used for the December 2010 regulatory inventory to develop estimates for the other years and pollutants in this report.

### Ocean-Going Vessels (OGV)

The OGV inventory in the PM2.5 SIP included vessel-specific data, improved vessel traffic network, vessel-specific hoteling and anchorage times, and improved vessel speeds. Staff has refined that inventory since then to support rulemaking in 2008 on the sulfur content in fuel. Staff has further updated that 2008 inventory in anticipation of amendments to the same fuel rule later this year. That information is used in this report. In general, the updates include improved algorithms for vessel speed reduction (VSR), auxiliary engine power, and estimating low load adjustment factors. Recession impacts are based on container throughput statistics for the Ports of Los Angeles, Long Beach and Oakland. OGV activity was down about 25% for the combined ports of Los Angeles and Long Beach and about 15% for the Port of Oakland between 2006 and 2009.

More information is available at <http://www.arb.ca.gov/ports/marinevess/ogv.htm>.

### Cargo Handling Equipment (CHE)

An update to the cargo handling equipment (CHE) inventory is currently underway using new information about the population, equipment usage, impacts of the recession and fleet turnover. The new model is still under development and not available for use in this report; therefore, staff scaled the existing PM2.5 SIP CHE emissions inventory to account for the new data.

The inventory used for the SIP was based on population and activity values from a 2001 to 2004 survey. As part of the adopted regulation, equipment owners were required to report the population of their equipment to ARB. Additionally, between 2005 and 2009 the ports and rail yards have conducted their own emissions inventories. This new information indicates that the total state population is slightly higher than originally assumed. These same data sources include updates to activity and load factor. However, changes in activity and load factors offset these increases in the population.

To account for these changes, staff compared baseline 2006 emissions from the original inventory to the draft updated inventory baseline. As discussed in a recent February workshop, emissions for PM and NOx emissions are approximately 20 percent and 27 percent lower, respectively. For this report staff assumed 2006 emissions were 27 percent lower than in the SIP. To forecast emissions forward from 2006, staff compared the original growth assumptions for CHE to the growth in port truck activity in the 2010 Truck and Bus Rule inventory model. Assuming that the CHE activity relates

Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

chiefly to the movement of shipping containers, staff reduced growth by approximately 20%.

More information is available at <http://www.arb.ca.gov/ports/cargo/cargo.htm>.

### Commercial Harbor Craft

In 2007 ARB adopted a commercial harbor craft regulation and adopted amendments to the original rule in 2010. Updates were made to the population of equipment, annual activity, and regional allocation. These changes are described in detail at <http://www.arb.ca.gov/ports/marinevess/harborcraft/hcdocuments.htm#regulatory>.

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**APPENDIX F: Revisions to 2007 PM2.5 and Ozone State  
Implementation Plan for South Coast Air Basin and Coachella Valley,  
March 2011**

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**Revisions to 2007 PM2.5 and Ozone State  
Implementation Plan for South Coast Air  
Basin and Coachella Valley**

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Appendix F

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air  
Basin and Coachella Valley

Executive Summary

This State Implementation Plan (SIP) revision updates the implementation status of the AQMD control measures to meet the 2015 PM2.5 attainment, and includes revisions to the control measure adoption schedule and modifications to the emissions reduction commitment to reflect changes made to the inventory resulting from CARB's December 2010 revisions to the on-road truck and off road equipment rules. The SIP revision provided addresses key elements in U.S. Environmental Protection Agency's (U.S. EPA) proposed partial approval and partial disapproval of the 2007 PM2.5 SIP for the South Coast Air Basin (Basin). The SIP revision retains the AQMD's proposal for contingency measures and also references and relies on CARB's proposed contingency measures that rely on reductions achieved through adopted rules that go beyond the RFP requirement. In addition, the SIP revision re-initiates its request that U.S. EPA voluntarily accept reduction responsibility for 10 TPD NOx emissions in 2014 for federal sources in the 2007 SIP, but provides a commitment to obtain a "fair share" additional 1 TPD NOx reductions in 2014 should U.S. EPA reject this request. Staff expects CARB to commit to its "fair share" of 9 TPD NOx reductions if necessary. AQMD is committing to provide 1.0 TPD NOx emissions reductions in the event that the backstop proposal becomes necessary.

Background

On November 22, 2010 U.S. EPA issued a notice of proposed partial approval and partial disapproval of the 2007 South Coast State Implementation Plan (SIP) for the 1997 Fine Particulate Matter Standards and the corresponding 2007 State Strategy. U.S. EPA proposed to approve the plan's inventory and regional modeling analyses; however it proposed to disapprove the attainment demonstration because it relies too extensively on commitments to emissions reductions in lieu of fully adopted and submitted rules. While the District has adopted enforceable rules that achieve more than 90 percent of its SIP emissions reductions commitment, the State Strategy and the recent actions to modify the on- and off-road emissions from heavy duty vehicles have not achieved the same percentage or been submitted to U.S. EPA as part of the SIP commitment. The notice also cited deficiencies in the SIP's contingency measures specifying the need for measures that are either fully adopted or otherwise ready for quick implementation and a trigger mechanism that achieves emissions reduction equivalent to one year of RFP. In addition, U.S. EPA affirmed that it would not accept the Plan's assignment of 10 tons per day (TPD) NOx emissions reductions to EPA as a contributing factor to its decision.

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Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air  
Basin and Coachella Valley

2007 AQMP and State Strategy Commitments

The 2007 Air Quality Management Plan was adopted by the SCAQMD Governing Board at its June 22, 2007 meeting and forwarded to CARB for inclusion in the SIP. The California Air Resources Board adopted the SIP, and the State Strategy for emissions reductions to meet the 2015 PM2.5 standard at its September 27, 2007 meeting. The two components of the SIP were submitted to U.S. EPA on November 16, 2007 for approval. As part of its share, the 2007 AQMP committed the District to reduce 18.8 TPD NOx, 10 TPD VOC, 2.9 TPD SOx and 2.9 TPD PM2.5 by 2014 of the needed emissions reductions to demonstrate attainment.

Update of the 2007 AQMP Implementation Status

The SCAQMD has fulfilled the overwhelming majority of its emissions reductions commitments specified in the 2007 SIP. Table-1 summarizes the progress achieved toward fulfilling SCAQMD's emissions reductions commitments to attain the 1997 PM2.5 annual and federal 8-hour ozone standards by the required dates. Through January 31, 2011, the SCAQMD Governing Board has amended and adopted 13 rules achieving approximately 96 percent of the District's SIP commitment outlined in the 2007 AQMP. The majority of these rules have been submitted to U.S. EPA and approved as part of the SIP. Several recently adopted District rules have been submitted to CARB to be submitted to and subsequently be evaluated by U.S. EPA.

The 96 percent achievement rate of the District's SIP commitment outlined in the 2007 AQMP represents the balance of emissions reductions achieved by calculating the relative contributions of VOC, NOx, PM2.5, and SOx based on PM2.5 formation potential. As summarized in CARB's staff report Proposed 2007 State Implementation Plan for the South Coast Air Basin - PM2.5 Annual and 8-Hour Average Ozone National Ambient Air Quality Standards (Appendix C, Tables-2 and -3) the relative contribution of the PM2.5 precursor emissions can be normalized to provide equivalent formation potential on a ton per day (TPD) basis. The common methodology chosen to express the formation potential is as equivalent NOx emissions reductions whereby 1-TPD VOC reduction is equivalent to 0.43 TPD NOx, 1-TPD directly emitted PM2.5 is equivalent to 9.86 TPD NOx, and 1-TPD SOx is equivalent to 15.03 TPD NOx. By applying these factors to the 2007 AQMP PM2.5 SIP the District committed to 87.43 TPD equivalent NOx reductions and through January, 2011 has achieved 83.89 TPD equivalent NOx reductions. If the balance were to be met by NOx alone, they are equivalent to 3.53 TPD of NOx. Similarly, they can be met by 0.36 TPD of PM2.5 or 0.24 TPD of SOx, based

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**Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air  
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on each pollutant's effectiveness in PM2.5 formation. The District will continue to pursue further reductions of each of these pollutants.

Tables 2 through Table 5 summarize the implementation status of each SCAQMD control measure with reductions attained vs. original SIP commitments. As stated in Chapter 4 of the 2007 AQMP (p. 4-2), substitution is allowed between measures to meet the overall SIP tonnage commitment. Table 2 through Table 5 note where such substitution occurs.

**Revisions to Reduction Commitment**

In Table 3, the 2014 emissions reduction commitment for the SOON Program has been revised from 12 TPD NOx reduction to 4 TPD to reflect ARB's update of the off-road emissions inventory in December 2010. The revised off-road inventory due to better information on equipment population, load factor, and expected activity level has resulted in lower baseline emissions. In other words, some of the reductions expected from this measure have already occurred due to reductions in the baseline inventory. Although SCAQMD's funding commitment and percent control efficiency for the SOON program remain the same, the expected reductions due to this measure are lowered from 12 TPD to 4 TPD. This change does not result in higher emissions in the air. Should the economy recover to the levels projected in the 2007 SIP by 2014, the expected reductions can reach 8 TPD.

**Revisions to Implementation Schedule**

A limited number of revisions to the 2014 implementation dates are proposed in Tables 2 through 5. Control measure EGM-01 rule adoption moves from 2010 to 2012 with full implementation for 2023. Control measure BCM-05 rule adoption is moved from 2010 to 2011-2012.

**Requirements for Contingency Measures**

The CAA requires that non-attainment area SIPs contain sufficient contingency measures such that upon implementation of those measures additional emissions reduction of up to 3 percent of the emissions in the adjusted base year would be achieved in the year following the year where the failure to meet milestone emission reduction targets or attain the NAAQS was observed. The CAA requires that the contingency measures be fully adopted or otherwise ready for quick implementation, with a trigger mechanism and implementation schedule that quantifies emissions reductions.

**Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air  
Basin and Coachella Valley**

The Final 2007 AQMP contained four contingency control measures (2007 AQMP, Table 9-1) to address the requirements of the CAA. The contingency control measures will be retained with a trigger for implementation of non-attainment of the PM2.5 standard by 2015.

As a practical matter, all feasible measures, to adopt as rules, are already included as 2007 AQMP main control strategy measures and thus are not available for use as contingency measures. However, U.S. EPA may continue to conclude that this is not sufficiently quick implementation. Therefore, the AQMD would also rely on implementation of CARB's contingency measures for the 2007 SIP as a whole, which are already adopted.

**Federal Measures Assignment**

A final key element in the notice of disapproval was the U.S. EPA's rejection of the SIP's assignment to EPA of 10 TPD NOx emissions reductions. The U.S. EPA cited that the CAA does not authorize a State to assign responsibility to the federal government for meeting SIP requirements. U.S. EPA did however recognize that the authority and responsibility to regulate certain nationwide sources is within its jurisdiction. The control measure in question requested federal funding to mitigate locomotive emissions. The sources in question would be those less well controlled than California regulated sources and the measure would be implemented to acquire equivalent emissions reduction to those estimated if Tier 4 NOx locomotive engine standards were enforceable in 2014.

SCAQMD understands that U.S. EPA's position is that a state may not, under the current Clean Air Act structure, unilaterally assign any portion of the SIP responsibility to U.S. EPA. However, we do not believe there is any prohibition on U.S. EPA voluntarily accepting such a responsibility. In this case it is only fair to do so, given the large percentage of remaining PM2.5 precursor emissions, after implementation of SCAQMD and CARB measures that is attributable to federally-regulated sources.

Should U.S. EPA continue to not accept assignment for this measure, SCAQMD will work with CARB to modify or develop control measures that commit equivalent emissions reductions to assure PM2.5 attainment to the extent needed. As part of its "fair share" the AQMD is committing an additional 1 TPD NOx emissions reduction in 2014 with ARB assuming the bulk of the federal assignment.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air  
Basin and Coachella Valley

**Table-1**  
SCAQMD PM2.5 SIP Implementation Status  
for the 2007 AQMP (TPD)

Pollutant	SIP Commitment by 2014		
	Commitment	Achieved	Balance*
VOC	10.40	14.40	+4.00
NOx	10.80	7.60	-3.20
PM2.5	2.90	1.00	-1.90
SOx	2.90	4.01	+1.11

\* If the balance for each pollutant were converted to NOx-equivalent values, the remaining tons required to be obtained would be 3.53 TPD NOx, which are still scheduled to be obtained by 2014 in NOx-equivalent reductions. Or, they can be met by 0.36 TPD of PM2.5 or 0.24 TPD of SOx, based on each pollutant's effectiveness in PM2.5 formation. The District will continue to pursue further reductions of each of these pollutants.

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**Table-2**

2007 AQMP Emission Reduction Commitment by Measure/Adoption Date (VOC)<sup>1</sup>

Control Measure #	Control Measure Title	Adoption Date		Implementation Date		2014 Reductions (TPD)		2023 Reductions (TPD)	
		Commitment	Achieved	Commitment	Achieved	Commitment	Achieved	Commitment	Achieved
MOB-05	AB923 Light-Duty Vehicle High-Emitter Identification Program [NOx, VOC] <sup>2(a)</sup>	On-going	On-going	2007-2020	On-going	0.8	0	0.7	0
FLX-02	Bakersfield Refinery Pilot Program [VOC and PM2.5]	2008	<sup>(a)</sup>	2010		0.7	0	1.6	0
CTS-01	Emission Reductions from Lubricants [VOC][R1144]	2008	2009	2010	2011	1.9	3.9	2.0	4.2
MOB-06	AB923 Medium-Duty Vehicle High-Emitter Identification Program [NOx, VOC] <sup>2(a)</sup>	2008	On-going	2010-2020	On-going	0.5	0	0.6	0
FLG-04	Pipeline and Storage Tank Degassing [VOC: R1149]	2007	2008	2008-2009	2008	NA	0.04	NA	0.04
BCM-03	Emission Reductions from Wood Burning Fireplaces and Wood Stoves [All]	2007-2008	2008	2008-2014	2008-2014	NA	0.44	NA	0.70
MCS-07	All Feasible Measures (R1125)	On-going	2008	2010-2020	2008	NA	0	NA	0
FLG-02	Emission Reductions from Gasoline Transfer and Dispensing Facilities [VOC]	2009	<sup>(a)</sup>	2010-2012		3.7	0	4.0	0
MCS-05	Emission Reductions from Livestock Waste [VOC]	2009	<sup>(a)</sup>	2011		0.8	0	0.6	0.0
EGM-01	Emission Reductions from New or Redevelopment Projects [NOx, VOC, PM2.5] <sup>3</sup>	2012		Beginning 2014		N/A	0	0.5	0

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## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

## Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air Basin and Coachella Valley

Table-2 Continued

2007 AQMP Emission Reduction Commitment by Measure/Adoption Date (VOC) continued

Control Measure #	Control Measure Title	Adoption Date		Implementation Date		2014 Reductions (TPD)		2023 Reductions (TPD)	
		Commitment	Achieved	Commitment	Achieved	Commitment	Achieved	Commitment	Achieved
MCS-01*	Facility Modernization [NOx, VOC, PM] R110,210 <sup>1</sup>	On-going	2008+	Beginning 2012		2.0	0.3	9.2	0.3
CTS-03	Consumer Products Certification and Emissions Reductions from Use of Consumer Products [NOx, VOC] and Commercial Facilities [VOC] <sup>2</sup>	2007-2010		2010-2020		NA	0	NA	0
CTS-04	Emission Reductions from the Reduction of VOC Content of Consumer Products not Regulated by the State Board [VOC] R1143 <sup>3</sup>	2008-2010	2009	2010-2020	2011	NA	9.7	NA	10.1

1. 2014 reductions estimated in average annual day, 2023 in planning inventory.

2. SIP, SOON and AB923 incentives are in place and implementation is ongoing.

3. The SOON and AB923 incentives are in place and implementation is ongoing.

4. AQMD lacks legal authority to adopt the control concept in the measure. SIP reduction commitment was met via excess reductions achieved from the CTS-04 (R1143).

5. No SIP emission reduction commitment for the PM2.5 Plan. Rulemaking is delayed due to potential co-benefits of SB375 reduction targets.

6. AQMD will continue to implement this measure to meet the overall SIP reduction commitment for 2023.

7. CTS-03 was adopted by CARB in November 2010. Emission Reductions from CTS-04 are not included in AQMD's SIP commitments and there is no double counting in emission reductions relative to CARB regulations.

8. Emission reductions taken in 2008; PM emission reductions taken in 2009; VOC emission reductions taken in 2010.

9. Not applicable, no SIP Reductions quantified in the 2007 AQMP.

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## Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air Basin and Coachella Valley

Table-3

2007 AQMP Emission Reduction Commitment by Measure/Adoption Date (NOx)<sup>1</sup>

Control Measure #	Control Measure Title	Adoption Date		Implementation Date		2014 Reductions (TPD)		2023 Reductions (TPD)	
		Commitment	Achieved	Commitment	Achieved	Commitment	Achieved	Commitment	Achieved
MOB-05	AB923 Light-Duty Vehicle High-Engineer Identification Program [NOx, VOC] <sup>2</sup>	On-going	On-going	2007-2020	On-going	0.4	0	0.4	0
OMB-01	NOx Reduction from Non-RECLAIM Open Drives and Furnaces [NOx] R1147 <sup>3</sup>	2008	2008	Beginning 2010		3.5	3.5	4.1	4.1
MOB-06	AB923 Medium-Duty Vehicle High-Engineer Identification Program [NOx, VOC] <sup>4</sup>	2008	On-going	2010-2020	On-going	0.5	0	0.6	0
MCS-01*	Facility Modernization [NOx, VOC, PM] R1102, PM146, PM146.1	2008-2010	2008+	Beginning 2012	2011	1.6	2.17	2.2	3.15
BCM-03	Emission Reductions from Wood Burning Stoves and Wood Stoves [AU] R443 <sup>5</sup>	2007-2008	2008	2008-2014	2008-2014	NA	0.06	NA	0.10
	SOON Program <sup>6,8,9</sup>	2008	2008	2014	2008-2014	4.8	1.8	NA	NA
OMB-03	Further NOx Reductions from Space Heaters [NOx] <sup>7</sup>	2009	2009	Beginning 2012	2012-2043	0.8	0.1	1.1	3.0
EGM-01	Emission Reductions from New or Redevelopment Projects [NOx, VOC, PM2.5] <sup>10</sup>	2012		Beginning 2014		0		0.8	

1. 2014 reductions estimated in average annual day, 2023 in planning inventory.

2. The SOON and AB923 incentives are in place and implementation is ongoing.

3. A revised SIP commitment of 4 TPD reflects ARB's update on the off-road emissions inventory in December 2010 and maintains the same control efficiency.

4. The upper range of 8 TPD excludes the impact of recession.

5. No SIP emission reduction commitment for the PM2.5 Plan. Rulemaking is delayed due to potential co-benefits of SB375 reduction targets.

6. The SIP shortfall for the 2014 reduction commitment was met via excess reductions achieved from the SOX RECLAIM amendments (CMB-02).

7. AQMD commits an additional 1 TPD of NOx, if necessary, as a backdrop measure should U.S. EPA not voluntarily accept responsibility for federal sources in the 2007 SIP.

8. NOx emission reductions taken in 2008; PM emission reductions taken in 2009; VOC emission reductions taken in 2010.

9. Not applicable, no SIP Reductions quantified in the 2007 AQMP.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air Basin and Coachella Valley

Table-4

2007 AQMP Emission Reduction Commitment by Measure/Adoption Date (PM2.5)

Control Measure #	Control Measure Title	Adoption Date		Implementation Date		2014 Reductions (TPD)		2023 Reductions (TPD)	
		Commitment	Achieved	Commitment	Achieved	Commitment	Achieved	Commitment	Achieved
BCM-03	Emission Reductions from Wood Burning Fireplaces and Wood Stoves [PM2.5]	2007-2008	2008	2008-2014	2008-2014	1.0	1.0	1.6	1.6
FLX-02	Petroleum Refinery Pilot Program [VOC and PM2.5] <sup>60</sup>	2008		2010		0.4		0.4	
ECM-01	Emission Reductions from New or Redevelopment Projects [NOx, VOC, PM] <sup>61</sup>	2012		Beginning 2014				0.5	
MCS-01*	Real-time Modernization [NOx, VOC, PM] <sup>62</sup>	On-going		Beginning 2010		0.4		1.7	
BCM-05	PM Emission Reductions from Under-fired Charcoalers [PM2.5] <sup>63</sup>	2011-2012		2014		1.1		1.2	

<sup>60</sup> Reduction commitment for the PM2.5 SIP was met via excess reductions achieved from the 2010 SOx RECLAIM amendments.

<sup>61</sup> No SIP emission reduction commitment for the PM2.5 Plan. Rulemaking is delayed due to potential co-benefits of SB375 reduction targets.

<sup>62</sup> This SIP was adopted as part of MCS-01 implementation in 2010, but PM2.5 reduction potential cannot be quantified. AQMD will continue to seek opportunities to further implement this SIP.

<sup>63</sup> Reduction commitment for the PM2.5 SIP was met via excess reductions achieved from the 2010 SOx RECLAIM amendments (CMB-02) and VOC reductions from CTS-03. The rulemaking will entail two phases with control equipment testing, certification, and deployment in 2011 and development of regulatory requirements in 2012.

\* NOx emission reductions taken in 2008; PM emission reductions taken in 2009; VOC emission reductions taken in 2010.

NA: Not applicable, no SIP Reductions quantified in the 2007 AQMP.

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Revisions to PM2.5 and Ozone State Implementation Plan for South Coast Air Basin and Coachella Valley

Table-5

2007 AQMP Emission Reduction Commitment by Measure/Adoption Date (SOx)

Control Measure #	Control Measure Title	Adoption Date		Implementation Date		2014 Reductions (TPD)		2023 Reductions (TPD)	
		Commitment	Achieved	Commitment	Achieved	Commitment	Achieved	Commitment	Achieved
CMB-02	Further SOx Reductions for RECLAIM (BARCT) [SOx]	2008	2010	2011-2014	2013-2019	2.9	4.0	2.9	5.7
BCM-03	Emission Reductions from Wood Burning Fireplaces and Wood Stoves [XII]	2007-2008	2008	2008-2014	2008-2014	NA	0.01	NA	0.02

NA: Not applicable, no SIP Reductions quantified in the 2007 AQMP.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**RESOLUTION NO. 11-9**

A Resolution of the South Coast Air Quality Management District Governing Board (AQMD) certifying the Addendum to Final Program Environmental Impact Report (PEIR) for the 2007 Air Quality Management Plan (AQMP) for a revision to the Final 2007 AQMP, to be referred to after adoption as the Revision to the Final 2007 AQMP.

A Resolution of the Governing Board of the AQMD adopting the Revision to the Final 2007 AQMP.

WHEREAS, the U.S. EPA promulgated 8-hour ozone and PM<sub>2.5</sub> standards in 1997, followed up by implementation rules which set forth the classification and planning requirements for State Implementation Plans (SIP); and

WHEREAS, the federal Clean Air Act requires SIPs for regions not in attainment with the 8-hour ozone and fine particulate standards be submitted no later than 3-years after the standards became effective, whereby, SIPs for the South Coast Air Basin and Coachella Valley must have been submitted for 8-hour ozone and PM<sub>2.5</sub> by June 15, 2007 and April 5, 2008, respectively; and

WHEREAS, the South Coast Air Quality Management District has jurisdiction over the South Coast Air Basin and the desert portion of Riverside County known as the Coachella Valley; and

WHEREAS, the South Coast Air Quality Management District is committed to comply with the requirements of the federal Clean Air Act; and

WHEREAS, the AQMD Governing Board finds and determines that the Revision to the Final 2007 AQMP, is considered a "project" pursuant to the California Environmental Quality Act (CEQA); and

WHEREAS, AQMD staff has reviewed the Revision to the Final 2007 AQMP and has concluded that the proposed project would result in no significant adverse environmental impacts; and

WHEREAS, AQMD staff has concluded that none of the modifications to the 2007 AQMP alter any of the conclusions reached in the Final PEIR for the 2007 AQMP and only minor technical changes or additions to the Final PEIR for the 2007 AQMP are necessary and none of the conditions in CEQA Guidelines §15162 apply so, an Addendum to the 2007 AQMP Final PEIR is the appropriate CEQA document (CEQA Guidelines §15164); and

WHEREAS, an Addendum to a previously certified EIR need not be circulated for public review and comment (CEQA Guidelines §15164(c)), but is attached herein to the Final PEIR for the 2007 AQMP; and

WHEREAS, the Governing Board shall consider the Addendum with the Final PEIR for the 2007 AQMP prior to making a decision on the proposed project; and

WHEREAS, it is necessary that the adequacy of the Addendum to the Final PEIR for the 2007 AQMP be determined by the AQMD Governing Board prior to its certification; and

WHEREAS, the Governing Board prior to voting on the Proposed Revision to the Final 2007 AQMP, has reviewed and considered the Addendum with the Final PEIR for the 2007 AQMP; and

WHEREAS, the South Coast Air Quality Management District Governing Board, adopted the 2007 AQMP dated June 1, 2007 consisting of the document entitled 2007 AQMP as amended by the final changes set forth by the South Coast Air Quality Management District Governing Board and the associated documents listed in Attachment 1 to the Resolution from June 2007, the Final Socioeconomic Report for the 2007 AQMP; the Final Program EIR for the 2007 AQMP, and the Statements of Findings and Overriding Considerations and Mitigation Monitoring Plan; and

WHEREAS, the Resolution, the 2007 AQMP as amended by the final changes (including all documents listed in Attachment 1 to the Resolution from June 2007), the emissions budgets as incorporated in the 2007 AQMP, and the Final Program Environmental Impact Report on the 2007 AQMP was forwarded to and adopted by CARB, and the Board Resolution requested that the 2007 AQMP be forwarded to the U.S. EPA for approval as part of the State Implementation Plan which CARB subsequently did; and

WHEREAS, on November 22, 2010, U.S. EPA published its notice of proposed partial approval and partial disapproval of the 2007 Air Quality Management Plan (AQMP) PM<sub>2.5</sub> Plan primarily because the attainment demonstration relies too heavily (i.e. greater than 10 percent) on emissions reductions from several State rules that have not been finalized or submitted to U.S. EPA for approval; and

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

WHEREAS, the 2011 revision to the 2007 PM2.5 and ozone SIP addresses the key elements of the proposed disapproval; and

WHEREAS, the 2011 revision to the 2007 PM2.5 and ozone SIP updates the implementation status of the AQMP control measures to meet the 2015 PM2.5 attainment; and

WHEREAS, the 2011 revision to the 2007 PM2.5 and ozone SIP retains the AQMD's proposal for contingency measures and also references and relies on CARB's proposed contingency measures; and

WHEREAS, the 2011 revision to the 2007 PM2.5 and ozone SIP re-initiates the request that U.S. EPA voluntarily accept reduction responsibility for 10 TPD NOx emissions in 2014 but will propose that AQMD and CARB jointly provide a "fair share" backstop emissions reduction proposal and includes the AQMD's commitment to obtain an additional 1 TPD NOx, if necessary; and

WHEREAS, the 2007 AQMP, as revised by the 2011 revision, includes every feasible measure and an expeditious adoption schedule; and

WHEREAS, significant emission reductions must be achieved from sources under state and federal jurisdiction for the South Coast Air Basin to attain the federal air quality standards; and

WHEREAS, said emission reduction programs have effectively improved air quality in the South Coast Air Basin for particulate matter less than 2.5 microns in diameter (PM2.5) and for 8-hr ozone; and

NOW, THEREFORE, BE IT RESOLVED, that the South Coast Air Quality Management District Governing Board hereby certifies that the Addendum to the Final Program Environmental Impact Report for the 2007 AQMP has been completed in compliance with the requirements of CEQA and finds that the Addendum to the Final Program Environmental Impact Report for the 2007 AQMP, is adequate and thereby approves it.

BE IT FURTHER RESOLVED, that because no significant adverse environmental impacts were identified as a result of implementing the Revisions to the 2007 PM2.5 and Ozone SIP, Findings, a Statement of Overriding Considerations, and a Mitigation Monitoring Plan are not required.

BE IT FURTHER RESOLVED, that the South Coast Air Quality Management District Governing Board hereby approves the 2011 Revisions to the 2007 PM2.5 and Ozone SIP.

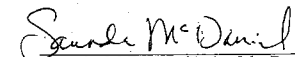
BE IT FURTHER RESOLVED, that the Executive Office is hereby directed to forward a copy of this Resolution, modified the 2011 Revision to the 2007 PM2.5 and Ozone SIP to CARB and to request that they be forwarded to the U.S. EPA for approval as part of the State Implementation Plan, and that U.S. EPA approve the 2007 PM2.5 and Ozone SIP as so modified.

AYES: Antonovich, Benoit, Burke, Cacciotti, Carney, Gonzales, Loveridge, Lyou, Mitchell, Perry, Pulido, and Yates.

NOES: None.

ABSENT: Nelson.

Dated: 3-4-2011

  
Sandra McDaniel, Clerk of the Board

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

1

Progress Report on Implementation of PM2.5 State Implementation Plans (SIP) for the  
South Coast and San Joaquin Valley Air Basins and Proposed SIP Revisions

**APPENDIX G: Analysis of Environmental Impacts**

ARB prepared an environmental analysis for the State Strategy for California's State Implementation Plan (SIP) for the New Federal PM2.5 and 8-Hour Ozone Standards prior to its approval by the Board in September 2007 (document available for review at <http://www.arb.ca.gov/planning/sip/2007sip/2007sip.htm> and at ARB's offices at 1001 I Street, Sacramento, California, Room 7-45). The State Strategy mapped out the actions ARB would take to reduce emissions to levels designed to bring California into compliance with federal air quality standards. Various measures identified in the 2007 State Strategy have been adopted by the Board since that time, and separate, additional environmental analyses were also prepared by ARB prior to the adoption of each of these measures. As part of tracking the implementation of the State Strategy, this progress report quantifies the emission reductions that have been achieved since adoption of the 2007 State Strategy. The proposed SIP revisions do not change the emissions levels of NOx, ROG, SOx, and direct PM2.5 that the Board committed to achieve by specific dates when it adopted the 2007 State Strategy.

The proposed SIP revisions include three components: (1) updates to ARB's rulemaking calendar, (2) updates to reasonable further progress (RFP) tables and associated reductions for contingency purposes, and (3) updates to the transportation conformity budgets. (See Appendix A for further descriptions of the revisions.) The proposed revisions do not cause any change that has the potential to result in a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment, for the following reasons.

The updates to the rulemaking calendar reflect the current status of measures that have already been adopted, and changes to the expected action dates for three measures that have not yet been adopted. For these measures, the updates to the rulemaking calendar do not change the measures or their expected implementation dates identified in the 2007 State Strategy. They merely change the dates by which ARB staff will bring these measures to the Board for proposed action by the Board.

The updates to the RFP tables and transportation conformity budgets are proposed accounting changes made to reflect the current status of adopted measures, better data, changes due to the recession, and methodological improvements to the emission inventory. These accounting changes do not change the strategies or commitments identified in the 2007 State Strategy to achieve specific emissions reductions by specified dates. Because no changes have been made to the strategies or the underlying emission reduction commitments in the 2007 State Strategy, there is no potential for any of the proposed SIP revisions to cause any significant adverse environmental impacts.

**Acoustic characterisation of high speed train ETR 500**

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**Summary**

New noise damping systems, the "Syope"• low noise wheels and sound absorbing fairings have been developed. The high speed tests of this systems are described in the paper.

**Abstract**

The evolution of high-speed railway systems needs the research and the development of technological solutions that must take into account both economic benefits and respect of the environmental conditions regarding the external noise emitted by railway vehicles.

During the test programme aimed to study the aerodynamic behaviour of high-speed trains, noise tests have been performed to check both the external and internal noise emitted by this kind of trains.

The measurements have been carried out on the new multi-voltage ETR 500 high speed-train formed by two locomotives and eight trailers. The locomotives have been equipped with standard wheels; the trailers have been equipped with 12 traditional wheel-sets having worn profiles and 20 wheel-sets having turned wheels; 8 of the latter have been set with the new low noise wheels manufactured by Lucchini and known as "Syope"•.

The tests plan included two phases. In the first phase all the train bogies have been equipped with a complete set of aerodynamic fairings: on 4 bogies, the fairings have been processed to be sound absorbing. In the second phase all the bogies had no fairings.

The design, the construction and the setting of the fairings was ordered by FS to AnsaldoBreda.

The ground measurements of noise have been performed during train pass-by at speed up to 300 kph on the high-speed railway line between Florence and Arezzo at the test site in Renacci, where the line characteristics are well known. In the meantime measurements of noise emission inside the ETR 500 trailers have been carried out.

The purpose of the research was checking the noise reduction during the train pass-by due to the combination of different types of wheel with standard fairings and sound absorbing fairings. Afterwards the research aimed to characterise the noise emission due to each type of wheel (as worn profile, new profile and "Syope"• wheels) under test.

On board the purpose was checking eventual effects due to the fairings.

In the paper the results of the tests will be given comparing the different experimental solutions.

(Syope"• = low noise wheel)

**Keywords**

Noise test, low noise wheels, high speed train, ground noise measurement, sound absorbing fairing

March 29, 2011

Appendix G

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## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

2

### 1 Introduction

The evolution of high-speed railway systems needs the research and the development of technological solutions that must take into account both economic benefits and respect of the environmental conditions regarding the external noise emitted by railway vehicles.

For this purpose, the railway company DB, SNCF and FS carried out a test programme aimed to study the aerodynamic behaviour of high speed trains (drug) and the noise emitted by railbound vehicles, up to the speed of 300 kph, and based on different technological solutions as:

- cover bogie area with fairing, standard and sound absorbing;
- fit low noise wheels on high speed train.

In summer 2000 was made a big effort by FS to organise a test campaign on the Italian high speed line, linking Rome to Florence, where speed up to 300 kph can be achieved only under test conditions.

We have taken advantage of opportunity to carry out a noise tests set of measurement and comparison between the different technological solutions, aimed at the assessment of the external and internal noise levels of rolling stock.

The tests were undertaken in October 2000 on the new multi-voltage ETR 500 (ETR 500PLT) high speed train, formed by two locomotives (power units) and eight trailers.

The paper describes the high speed tests and presents the main results achieved in line measurements.

### 2 Tests aim

The purposes of the research were:

- at ground level, checking the noise reduction during the train pass-by due to the combination of different types of wheel with standard fairings and sound absorbing fairings. Afterwards the research aimed to characterise the noise emission due to each type of wheel (as worn profile, new profile and low noise wheels) under test;
- on board, checking eventual effects due to the different technological solutions.

### 3 Tests campaign

The tests plan included two phases:

- in the first phase all the train bogies have been equipped with a complete set of aerodynamic fairings: on 4 bogies, the fairings have been processed to be sound absorbing;
- in the second phase all the bogies had no fairings.

In both phases were carried out external and internal noise measurements.

The ground measurements of noise have been performed during train pass-by at speed up to 300 kph on the high-speed railway line between Florence and Arezzo at the test site in Renacci, where the line characteristics are well known. In the meantime measurements of noise emission inside the ETR 500PLT trailers have been carried out.

### 4 Main features of test train ETR500PLT

The standard composition operating in Italy consists of 2 locomotives (power units) and 11 trailer cars; train under test was formed by two locomotives (power units) and eight trailer cars with a total length of 249,7m.

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The figure 1 shows a schematic side view of ETR500PLT and the direction of the motion compared to the ground measuring location, the table 1 lists the type of trailer cars.

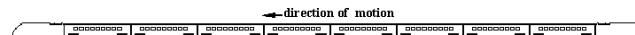


Figure 1 side view of ETR500PLT

M2	C8	C7	C6	C5	C4	C3	C2	C1	M1
locomotive	1 class	1 class	business	dining	2 class	2 class	2 class	2 class	locomotive

Table 1

The table 2 lists the neighbouring bogies equipped with the same type of wheels; those, aimed at particular research, are listed as measurement point (P1, P2,...).

Neighbouring bogies	Wheel type	Measurement points
C8-C7	Standard	
C7-C6	Low noise	P5
C6-C5	Low noise	P4
C5-C4	Standard (turned)	P3
C4-C3	Standard (turned)	P2
C3-C2	Standard (turned)	P1
C2-C1	Standard	

Table 2

The locomotives have been equipped with standard wheels of diameter of 1040mm.

The diameter of trailer cars wheel is 890 mm.

In the first phase all the train bogies have been equipped with a complete set of aerodynamic fairings, in the second phase all the bogies had no fairings.

The figure 2 shows a trailer car with fairing (top) and a trailer car without fairing (bottom).

The fairings were made by two elements, the first one fixed to the car frame and the second one to the bogie frame; openings were necessary to allow, for instance, the view of the brake indicators and of the dampers.

The fairings of the neighbouring bogies C6-C5 and C5-C4 and the part of the body trailer over these bogies have been processed to be sound absorbing.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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Figure 2 Bogie with fairing (top) and without fairing (bottom)

## 5 Ground measurements

### 5.1 Microphone positions

Figure 3 shows the microphones positions at the test site.

A first microphone, for environmental impact measure, was placed at a distance of 25 m from the centre line of the track and at height of 3.5 m above the upper surface of the rails.

A second microphone position, for evaluation of rolling sources and for comparison of the noise emission due to each type of wheel under test, was located at a distance of 1 m from the nearest track and at height of 0.5 m above the upper surface of the rail.

Both microphones were linked to a real time analyser for acquisition of the frequency spectra.

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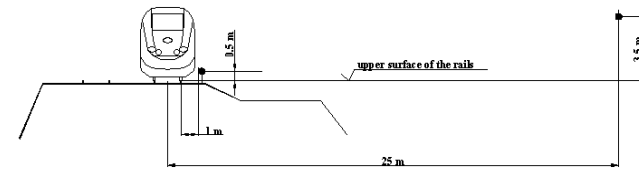


Figure 3 Microphone positions

### 5.2 Measurements analysis

The individuation of rolling sources (wheels) and comparison between the technological solutions fitted for noise abatement in the bogie area (fairing) was performed with the analysis of measurements recorded by the microphones placed at distance of 1 m from the track and at height of 0.5 m.

The spectrogram analysis shows clearly the difference on noise emission between the different kinds of wheels in both condition with and without fairings.

In the range of frequency 1.2 – 2.0 kHz, the outline of S.P.L. curve at frequency of 2.0 kHz allows to individuate measurement and comparison points (P) of every neighbouring bogies.

The figure 4 shows, respectively, the spectrogram Lin. recorded during passby of the train with fairing at speed of 300 kph and the outline of S.P.L. Lin. curve at frequency of 2.0 kHz.

The figure 5 shows, respectively, the spectrogram Lin. recorded during passby of the train without fairing at speed of 300 kph and the outline of S.P.L. Lin. curve at frequency of 2.0 kHz.

The comparison between the figures 4 and 5 points out the different noise emission in the two conditions with and without fairings, and the difference of noise levels emitted by the couples of neighbouring bogies equipped with low noise wheels (P4 and P5).

The comparison between the passby of the bogies with, respectively, standard and low noise wheels, measure Points P3 and P4, for the frequency of 2.0 kHz shows a difference of noise levels as:

- 4 dB with fairing
- 6 dB without fairing

The figure 6 shows the comparison of S.P.L. Overall A-weighted between the neighbouring bogies fitting standard wheels, measure point P3, and low noise wheels, measure point P4, in condition with fairings.

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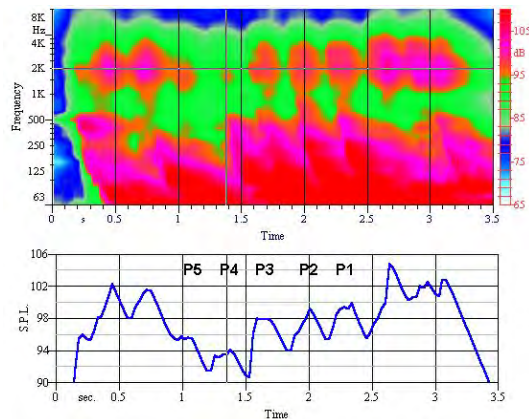


Figure 4 With fairing

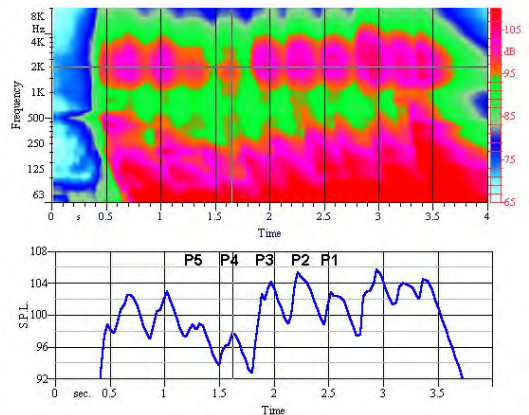


Figure 5 Without fairing

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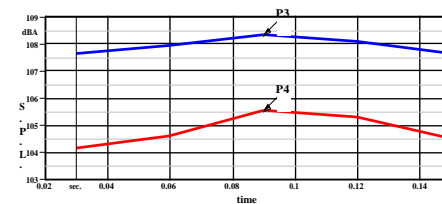


Figure 6 Comparison of S.P.L. Overall A-weighted between measure points P3 and P4

In this case the difference of noise level is about 3 dB. Therefore, the fairings produce a marked effect; the low noise wheels too produce effect that is more appreciable in the condition without fairings.

### 5.3 Environmental impact

The environmental impact was analysed with measures recorded by the microphone placed at a distance of 25 m from the central line of the track and at a height of 3.5 m above the upper surface of the rails.

The figure 7 shows the environmental impact and the comparison between the conditions with and without fairing.

Some of the main noise sources of high speed train are localised in the head and tail of the train, in the bogie parts and in the pantographs zone.

Although all these sources contribute to the noise emission of the train, as unique source; at the distance of 25 m it is also possible to locate, in condition without fairings (fig. 7 curve 2), the passby of the neighbouring bogies more clearly than in condition with fairings (fig 7 curve 1).

The effect of noise reduction produced by fairings is evident in the measure points P1 and P2, bogies fitted with standard wheels; it also clear the contribution of the low noise wheels to the abatement of noise emission (P4 and P5).

The curve 3 shows the reference for the individuation of the measure point (P) during passby of the train.

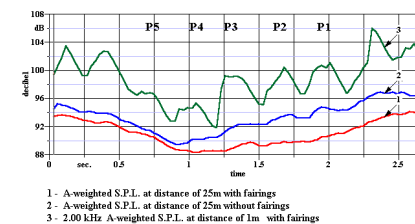


Figure 7 Comparison of A-weighted S.P.L. at distance of 25 m with and without fairing during passby of the train

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The figure 8 shows all the frequency spectra in the domain of time (passby time); in this diagram it is possible to point out, better and clearly, the strong effect of rolling noise reduction due to the low noise wheels (P4, P5).

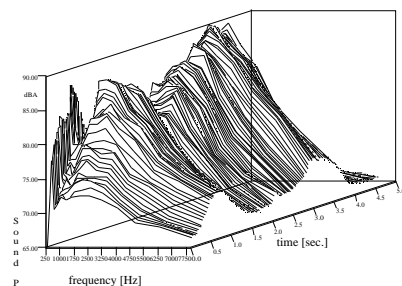


Figure 8 frequency spectra

## 6 On board measurements

### 6.1 Microphone positions

Positions of microphones on board are shown in the figure 9.

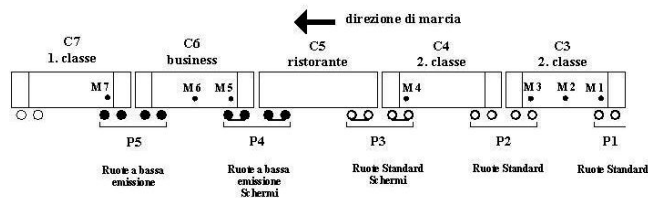


Figure 9 Microphone positions on board

The microphones M1, M3, M4, M5 and M7 were placed in the area above the bogies, M2 in the centre line of the open car and M6 in the centre of a closed compartment. All microphones were positioned at a height of 1.2 m above the floor. Criteria of microphone's disposition respect the necessity of comparing the noise levels inside trailer cars between the different proposed solutions:

- for all the measurement points (M) it is possible to compare the data acquired in condition with and without fairings;

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- for the microphones M3, M4 and M7, related to the measure points P2, P3 and P5, is possible to compare the different solutions as described in the following table (table 3):

Measure Point	Microphone	With fairing	Without fairing
P2	M3	• Standard wheels(turned)	• Standard wheels(turned)
P3	M4	• Standard wheels(turned) • Sound absorbing shield • Sound absorbing fairing	• Standard wheels(turned) • Sound absorbing shield
P5	M7	• Low noise wheels	• Low noise wheels

The microphones M5, related to the measure point P4, and the M6 were placed inside a trailer car (business) with internal structural features much different from other trailer cars (open saloon of 1<sup>st</sup> and 2<sup>nd</sup> class) so the recorded measures have to be compared only in the configuration with and without fairing.

### 6.2 Measurements analysis

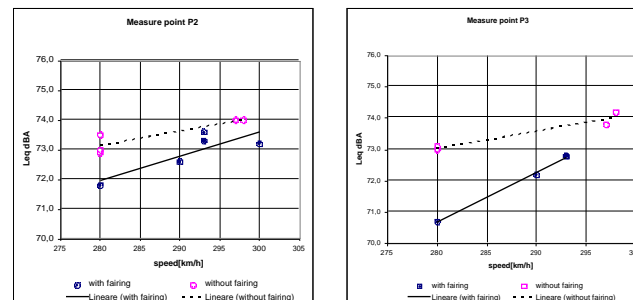
The test plan was prepared to allow the test runs up to the speed of 300 kph on the section of high speed line linking Florence to Arezzo where it was placed the ground measure site. During the runs on this section, data of S.P.L. were acquired in the measure points M, shown in figure 9, for the speed range 280 – 300 kph.

In phase of analysis, it was processed the A-weighted equivalent continuous sound pressure level ( $L_{pAeq}$ ) for the time interval during which the speed of train was constant, and however this time was not lower than 10 seconds.

The  $L_{pAeq}$  values of every microphones were carried out in a graph related to the performed speed of train in conditions with and without fairing.

The figure 10 shows the comparison of the data acquired in two measure points (P2 and P3).

For each measure points, the values in condition with fairings were always lower than in condition without fairing ( $\Delta \approx 1$  dB(A)) for all speed in the range 280 – 300 kph.

Figure 10  $L_{pAeq}$  values as function of speed for measure points P2 and P3

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The figure 11 shows comparison between  $L_{pAeq}$  values carried out the measure points P2, P3 and P5, in condition with and without fairings and related to the following solutions: P2 and P3 standard wheels, P5 low noise wheels.

In the two graphs it is possible to see clearly the contribution of low noise wheel that yield a noise reduction of about 1.5–2 dBA, particularly in condition without fairings.

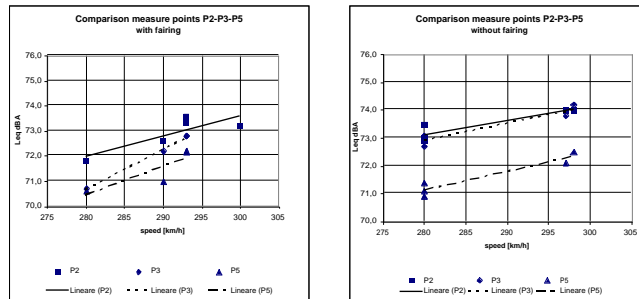


Figure 11 Comparison between the measure points P2,P3 and P5

In the same figure 11 it is possible to see that the effect of the sound absorbing shield, fitted under the floor of body car and over the bogies of measure points P2 and P3, are effective with fairing and negligible without fairings.

### 7 Conclusions

The tests were performed during the campaign aimed to the study of aerodynamic behaviour of high speed trains: on board some other test teams and instrumentation were working. These particular conditions may have influenced the noise measures; moreover, the programmed number of test runs up to 300 Kph doesn't allow a in-depth research of all noise effects inside and emitted by rolling stock.

The authors hope to perform new tests in the future to complete this study.

At this moment we can conclude that:

- with fairings it was observed an abatement of external noise emitted by the high speed train with a contribution of low noise wheels; on board it wasn't pointed out negative effects; in this case we have observed a sensible contribution of low noise wheels;
- without fairings it was observed a strong effect of low noise wheels in the abatement of rolling noise without increase of noise level on board.

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### Bibliography

- [ 1 ] Chiocchia G.: "Il problema del rumore nei treni ad alta velocità". Le Strade, anno XCV n.1294 Giugno 1993
- [ 2 ] Schulte-Werning B. et alii: "High Speed Trains with Bogie Fairings: European Research into reducing Aerodynamic Drag and Noise". World Congress of Railway Research WCRR '99, Tokyo, Japan, October 1999
- [ 3 ] prEN ISO 3381: Railway applications, Acoustics, "Measurement of noise inside railbound vehicles". January 2001
- [ 4 ] prEN ISO 3095: Railway applications, Acoustics, "Measurement of noise emitted by railbound vehicles". January 2001

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NOISE AND AIR POLLUTION OF HIGH-SPEED  
RAIL SYSTEMS<sup>1</sup>

By R. L. Wayson<sup>1</sup> and W. Bowlby,<sup>2</sup> Members, ASCE  
(Reviewed by the Urban Transportation Division)

**ABSTRACT:** Transportation noise and air pollution problems are a nemesis to our modern society. Each transportation system, high-speed rail (HSR) included, has its own noise spectra, characteristic air pollutant emissions, and particular environmental problems. This paper presents a review of noise levels from different types of European and Asian high-speed rail systems. Also presented is a comparison of associated air pollutant emissions. Comparisons of the European and Asian HSR noise levels are made with diesel rail propulsion, rapid-rail transit, and existing rail noise standards. This permits a review of how HSR noise might affect the surrounding community since these systems are not yet operational in the United States. Noise abatement for high-speed rail systems is also discussed. High-speed rail relies on electric propulsion. Accordingly, the only air pollutants directly emitted are by the wheel bearings, freight, and/or entrained dust, all of which are generally insignificant. However, the power required of the electric power plant and the subsequent release of air pollutants at the plant must be considered to be attributable to the high-speed rail system. The paper includes comparison of these releases with the air pollutants emitted by diesel locomotives and a typical aircraft. Finally, conclusions on the prediction of total air pollutant load and noise levels for high-speed rail are discussed.

INTRODUCTION

High-speed rail (HSR), which has been defined by the American Society of Civil Engineers (ASCE) as being greater than 125 mph (201 km/h), has been developed in Europe and Asia for quite some time (ASCE 1985). However, HSR has yet to be developed in the United States. The Northeast Corridor portion of the Amtrak system, with speeds as high as 120 mph (193 km/h), is the closest system the U.S. has to an HSR system, although several systems have been proposed.

Environmental concerns such as air quality and noise are high on the list of possible problem areas for these proposed systems. The National Environmental Policy Act (NEPA) requires any federally funded or federally involved project to have performed an environmental analysis. However, as was learned with a planned project in the Los Angeles-San Diego corridor (Smith and Shirley 1987), even privately funded HSR projects will usually require an environmental assessment. Accordingly, environmental document preparation must be considered an integral part of the preliminary engineering of any HSR system. Proper prediction tools must be developed to evaluate HSR.

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HSR is in direct competition with other modes of intercity mass transportation. Because of this, HSR must show benefits over competing modes in order to be implemented. Because of the high capital costs associated with track restructuring and other required tasks, economics, at least in the short run, cannot usually be shown to be a benefit. Accordingly, other HSR benefits must justify HSR over implementation of other modes of transportation for the project to be feasible. One such benefit is the area of environmental considerations.

This paper will present information that should be of help to those individuals involved in this environmental process. First, for comparative purposes, noise and air pollution characteristics of conventional intercity transportation modes in North America, diesel-powered rail, rapid-rail transit, and aviation, are described. Intercity buses were not considered because of the poor comparison to HSR and since by their nature they are prone to emit greater amounts of pollution on a passenger-mile basis. Then the same characteristics are presented for HSR systems in use elsewhere throughout the world. Vibration, another important topic, is not discussed in this paper. Finally, a guide for predictive modeling of noise and air quality is presented.

Noise

Noise of Conventional North American Rail Systems

A basis for comparison of HSR noise levels may be established by examining existing conventional North American intercity transportation systems. Although HSR operations are probably more in competition with airlines than other railroads, comparisons of noise emission levels of HSR and aviation are of little practical use because of spatial variations in aircraft flight paths. A more practical noise level comparison is between HSR and conventional rail operations. To provide these comparisons, noise levels from existing HSR, diesel, and rapid-rail systems have been compiled in this paper, as well as data from the Northeast Corridor system and federal noise standards. These data are discussed separately below.

Diesel Operations

Noise from diesel operations is made up of two primary sources: the locomotive engine and the wheel/rail interaction.

Locomotive engine noise is composed of three dominant sources: engine exhaust, engine crankcase, and electric radiator cooling fans. Tests by General Motors show the cooling fan noise to be significant (Goding 1980). Maximum "A-weighted" noise levels for three typical pre-1980 engine types at 100 ft (30 m) from the centerline of the tracks vary from 67 dBA at idle to 89 dBA at full throttle (Goding 1980). ("A-weighted" noise levels represent a weighted composite of the entire noise spectrum.) Cooling fan operation is shown to increase these levels by an additional 1–2 dBA. Of note is that an approximate 20-dBA increase occurs from idle to full throttle. Other studies have determined exhaust noise levels to be 86–94 dBA at 100 ft (30 m), noise from engine casing 80–86 dBA, and cooling fan noise from 80–84 dBA (Hanson 1976).

Exhaust silencers were used after 1979 due to federal legislation. The spectra for two of the three engine types are shown in Fig. 1 (Goding 1980). The effects of the silencers on the post-1979 locomotives should be noted. For

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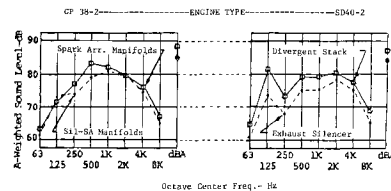


FIG. 1. Noise Reduction Silencer-Spark Arrestor Manifolds on GP38-2 and SD40-2; 30 m, Stationary, Full Load, Fans Off [from Goding (1980)]

example, the A-weighted noise levels for the GP38-2 and SD40-2 engines were reduced by 3 dBA. Also of note are the sharp fall-off of noise levels below 125 Hz and over 8 kHz. The peak at 125 Hz is caused by the predominant 120 Hz firing frequency; thus, the silencers are tuned expansion chambers for this frequency.

Radiator cooling fan noise also had to be considered. If the federal standards (presented later) were to be met, this noise source had to be quieted also. To accomplish this goal, a redesign of the fan inlet assembly was required. The newer fans were 8 dBA quieter (approximately 77 dBA). Since sound levels are combined logarithmically, the new reduced fan noise added little to the total A-weighted levels, which remained essentially as shown by Fig. 1.

Wheel/rail noise is another consideration and is dependent on many parameters. Wheel/rail noise will vary dramatically according to type of wheel/bogie and rail/track structure (Remington 1976; Fischer 1976). Curve squeal may also occur from lateral sliding of the wheels caused by a stick-slip process (Blennenmann 1985), but for the purpose of this paper and the difficulty of prediction, will not be considered here. To be considered is that wheel/rail noise is a function of speed. Fig. 2 shows noise emission factors that have been developed for typical rail cars (USDOT 1981, 1982). It is interesting to note the much greater speed dependence associated with the 1982 study. The logarithmic relationship is very noticeable.

The maximum A-weighted sound level of many passbys has also been correlated (Stanski 1984b). The data scatter should be noted ( $r = 0.520$ ) for the best-fit least-squares line, but the data do provide a basis for comparative purposes and permits an equation to be developed. The equation is:

$$L_A = 11.09 \log V + 70.8 \quad (1)$$

where  $L_A$  = maximum A-weighted sound level, and  $V$  = speed in mph. This empirically based prediction provides a basis to estimate noise emissions for diesel operations. It should be noted that the noise level is proportional to the logarithm of the velocity.

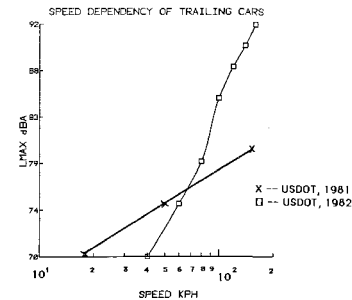


FIG. 2. Noise from Trailing Cars, Conventional Rail [data from USDOT (1981, 1982)]

#### Rapid-Rail Transit

Rapid-rail transit, a passenger-oriented service, is also dominated by two noise sources, the on-board electric engine and wheel/rail interaction. However, the gross tonnage is much less than that of diesel or freight operations. Thus, the smaller horsepower requirements and electric engine result in less noise from the engine source. The overall train is lighter, closer to the ground, and usually has smoother track and rail conditions. This causes the wheel loading to be less and the wheel/rail noise to be less. The lower noise-source height can also be more easily attenuated by the terrain, decreasing noise levels further. Accordingly, noise levels are generally less for rapid-rail transit than for diesel operations at comparable speeds. For example, the noise level for San Francisco Bay Area Transit System trains at 60 mph (97 km/h) and 50 ft (15 m) is approximately 82 dBA. The Washington D.C. Metro system noise levels at 60 mph (97 km/h) are approximately 83 dBA. The Chicago Transit Authority noise levels are approximately 80 dBA (Wilson 1977). These values of 80–83 dBA at 50 ft (15 m) are much less than the value reported for diesel operations, full throttle, at 100 ft (30 m) [97 dBA, when corrected to 50 ft (15 m)]. Damped wheels can reduce the reported noise levels by 1–2 dBA.

#### Northeast Corridor

The closest implementation to HSR in North America is the Northeast Corridor Improvement Program. This rapid-rail system is capable of speeds up to 120 mph (193 km/h), and faster speeds were originally hoped for by 1990. The service evaluation tests for this system were conducted on two high-speed locomotive types, the General Electric E-60CP and the Swedish ASEA RC4 (Hanson 1977). The tests were made at speeds ranging from

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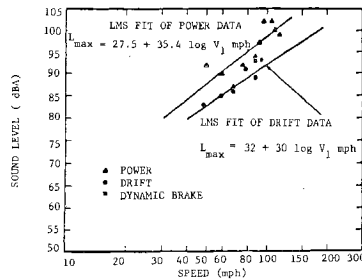


FIG. 3. General Electric E-60 Passby Levels:  $L_{max}$  at 15 m [from Hanson (1977)]

50–120 mph (80–193 km/h). The continuous welded rails were tie and ballast. The results for the E-60CP engine, for both drift and power, are shown by Fig. 3. Note the equations on the figure are

Drift

$$L_A = L_{max} = 32 + 30 \log V, \quad \text{where } V \text{ is in mph} \quad (2)$$

Power

$$L_A = L_{max} = 27.5 + 35.4 \log V, \quad \text{where } V \text{ is in mph} \quad (3)$$

The ASEA RC4 results are not shown, but are similar to the E-60CP engine. The derived equations were

Drift

$$L_A = 37 + 27 \log V, \quad \text{where } V \text{ is in mph} \quad (4)$$

Power

$$L_A = 23 + 34.5 \log V, \quad \text{where } V \text{ is in mph} \quad (5)$$

The logarithmic effect of speed on each is noteworthy. Although the testing was limited to one vehicle of each type, it can easily be concluded that the noise levels from these electric locomotives were a definite improvement over existing diesel operations noise levels.

The trailing car noise would be very similar to those results shown for rapid-rail transit, allowing for the speed-dependent characteristics of wheel/rail noise.

#### Federal Rail Noise Standards

The Noise Control Act of 1972 provided authorization to establish federal noise emission standards for products distributed in commerce and required the Environmental Protection Agency (EPA) to promulgate standards. The

USDOT was required to draft compliance regulations limits on "noise emission resulting from operation of the equipment and facilities of surface carriers engaged in interstate commerce by railroad." The compliance regulations required noise analysis to be conducted, and feasible noise reduction measures to be implemented. Though initially issued on December 31, 1975, full implementation did not occur until January 15, 1984 (Stusnick 1984).

The standards regulated the two noise sources of a train passby (locomotive and wheel/rail noise) as well as yard and equipment sources (Stusnick 1984). The standard of concern here is for locomotives built after December 31, 1979, which at 100 ft (30 m) should not exceed 90 dBA ( $L_{max}$ ) for moving conditions. The standards reflect noise levels greater than expected from even existing diesel operations and so are only meant to stop incorrectly operating diesel engines. Trailing cars are regulated according to speed. This corresponds to an allowance for wheel/noise dependency and engine throttle settings.

The previous discussion shows that diesel operations have a larger amplitude than rapid-rail transit or the Northeast Corridor trains at similar speeds. These systems should provide an excellent comparison to HSR in environmental documents.

#### Noise of HSR Systems

Complete information on the full range of HSR systems, which include diesel/electric operations, turbine-powered locomotives and electric-powered locomotives, must be gathered outside the United States. For example, the British run an HSR service using diesel/electric locomotive propulsion. However, this system was thought not to be of a type that would be used in pending North American HSR projects and so was not evaluated in this paper. Similarly, turbine-powered trains, which are reported by ANF-Industrie (France) to be on the verge of high-speed operations, do not seem to be under consideration by any North American projects and thus were not reviewed. An electric HSR locomotive with possibilities for the future is the Canadian LRC, but it is not discussed herein due to inconclusive data; likewise the HSR in Italy was not reviewed.

The electric HSR locomotives that were reviewed included the Japanese Shinkansen, the French TGV (Trains à Grande Vitesse), the German ICE (Intercity Express), and MagLev (Magnetic Levitation) designs. Each of these systems are on the same order of size as the electrically powered vehicles described for rapid-rail transit with the exception of MagLev, which is experimental. Thus, noise levels are similar for electric operations of both, allowing for speed-dependent characteristics. Wheel/rail interaction is the most intense noise source for electric HSR operations as compared to the dominance of locomotive engine noise for diesel rail operations (Arai and Yoshio 1975). One benefit of HSR is that the absence of at-grade crossings eliminates horn noise.

#### Japanese Shinkansen

The first HSR to begin service was the Tokaido Shinkansen in 1964. Since that time the Sanyo and Shinkansen have begun service and six other lines are planned (JNR 1984). The long time in service of these HSR systems has allowed more noise data to be collected than on the newer or experimental lines.

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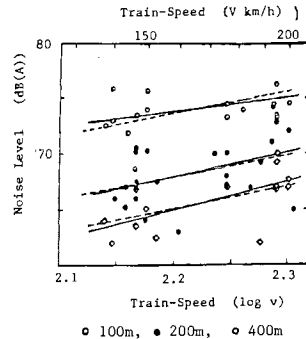


FIG. 4. Relation between Train Speed and Noise Level: Solid Lines Represent Estimated Relations at Each Distance and Broken Line Represents Average [from Matsuhisa and Shibata (1975)]

The effects of distance and speed on HSR noise levels must be considered. Fig. 4 shows an excellent graphic of these effects (Matsuhisa and Shibata 1975). Noise levels range from 62 dBA [1,312 ft (400 m), 118 mph (190 km/h)] to 76 dBA [328 ft (100 m), 124 mph (200 km/h)]. Of note are the following:

1. The noise level does not decrease linearly for each doubling of distance as would be expected (probably due to ground impedance).
2. Geometric spreading has much more effect on the noise levels at high speed than does changes in speed (noise levels are influenced more by distance than changes in speed).
3. The noise level measurements are correlated with the logarithm of speed.

The Shinkansen noise levels from various geometric designs were reported by Arai and Yoshio (1975). The work included measurement of noise levels at 82 ft (25 m) from the track centerline with a receiver height of 3.9 ft (1.2 m) above ground from various site conditions. The Shinkansen trains have 12-16 cars. Fig. 5 shows the noise spectra results and the overall A- and C-weighted noise levels for four cases with a train speed of 124 mph (200 km/h): a bridge situation, a viaduct, on an embankment, and in a cut. Of note are the strong low-frequency components for the bridge and viaduct, apparently from structure-radiated noise. The levels in the cut show the ef-

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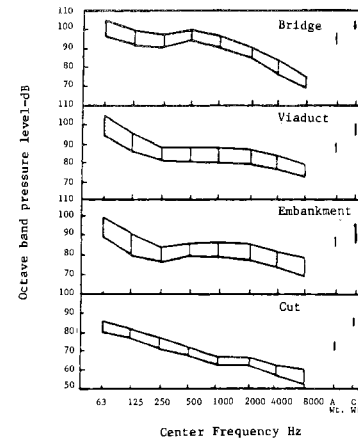


FIG. 5. Noise Spectra at Key Points; 200 km/h [from Arai and Yoshio (1975)]

fectiveness of the cut in blocking the sound propagation path. From Fig. 5, it is shown that geometric design can be used as a noise mitigation strategy.

Noise barriers are also a good way to block noise and can be extremely effective when properly designed for HSR systems (Matsuhisa and Shibata 1975). One should note, however, that noise at frequencies below 500 Hz is not as effectively blocked by the barrier due to the longer wavelengths. A thorough study was done by Nimura et al. (1975) for the then-new Japanese Tohoku line. Frequency-dependent spectra were collected for a section of track with noise barriers (Nimura et al. 1975). The overall A-weighted noise level was approximately 80 dBA at 82 ft (25 m). A large part of this was from a third noise source other than locomotive engine or wheel/rail noise, which was identified and shown to be significant due to electrification.

This third source is the current collection device noise (catenary noise) caused by the friction noise from the sliding contact of the pantograph-slider and trolley wire. Arai and Yoshio (1975) note that catenary noise becomes greater in the higher speed ranges because of arc-discharge noise that occurs

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due to a chattering phenomenon between the slider and wire. The height of this source makes it difficult to attenuate by noise barriers in a cost-efficient manner.

Nimura later substantiated his earlier work by showing noise levels of 82 and 87 dBA for other Japanese wall configurations at 82 ft (25 m) from an elevated road bed (Nimura et al. 1976). Other findings of importance were that by changing the ballast mat, further reductions in the noise levels may be achieved and care must be taken in the design of noise walls on structure to prevent reradiation of very low frequency noise or "infrasound." (Nimura et al. 1976).

This second finding is evident because the worst noise problems on the Japanese line are reported to occur on steel bridges (Hidehiko and Massaki 1978). However, noise barriers on these structures can be extremely effective, if properly designed. Damping of the main girders and sound absorptive treatment on the inside of the noise barriers are important. The damping reduces structure-borne noise. The absorptive treatment prevents noise reverberation between the barrier and the side of the rail car, which "spills" over the top of the barrier, increasing levels at the receiver. Reductions of up to 25 dBA have been shown for various barrier designs on a line with trains traveling at 99.4 mph (160 km/h) (Hidehiko and Massaki 1978).

These different noise reduction measures have proven to be effective in Japan. In 1985, it was reported by the Japanese Environment Agency that "various measures taken regarding noise sources have considerably reduced the noise level, and noise exceeded 80 dBA at no point excepting steel bridges" (JEA 1985).

A noise level decrease of 18.7 dBA between distances of 41 ft and 328 ft (12.5 m and 100 m) was found for at-grade sections, and 10.1–11.4 dBA was found for viaducts and embankment sections. These decreases show that the reduction due to geometric spreading may change according to site geometry and ground impedance. It can also be concluded that the noise-level fall-off rate could correspond to a line source (3 dBA per doubling of distance) or a point source (6 dBA per doubling of distance) according to the particular site geometry and ground cover. Accordingly, for predictions, a rate between a line source and point source fall-off should be used.

## French TGV

An operating system that others are often compared to is the French TGV. The ten-car trains (two power cars and eight passenger cars) have an average operating speed of 168 mph (270 km/h) and are capable of speeds over 200 mph (322 km/h). The TGV Atlantique line, scheduled for completion in 1989–1990, will operate at an average speed of 186 mph (300 km/h) (Bergougnan, personal communication, 1986).

Noise levels are also a concern for the French. Between Paris and Lyon, a maximum noise level of 97 dBA at 82 ft (25 m) was reported for a train speed of 169 mph (272 km/h) (SNCF 1983). The track for these loud occurrences was continuously welded, with reinforced concrete ties and crushed stone ballasts. However, despite these high levels, a level of 75 dBA was found to be exceeded at only three homes along the line, primarily due to the wide, dedicated right-of-way.

A study of noise levels measured under the bogie provide an insight to the speed dependency of the TGV (Vernet 1984). This study substantiates

a previous conclusion for the Japanese Shinkansen that at speeds in the HSR range, the effects of geometric spreading and noise barriers are greater than the effects of speed changes (only a 17-dBA range occurs between speeds of 50 mph and 186 mph (80 and 300 km/h)). This represents a  $30 \log V_f/V_o$  relationship to maximum noise levels, where  $V_f$  = final train speed; and  $V_o$  = initial train speed. Also of note from this study is that a 15-dBA increase in noise could occur if the rail conditions changed from "very good" to "showing signs of rail corrugation." This points out the possible attenuation that may occur from maintaining a very smooth rail.

Besides the experiences with wheel/rail noise, the French have had similar experiences with noise abatement techniques as the Japanese (Bergougnan, personal communication, 1986). Walls and depressed sections have been used effectively in some urban areas, but bridges still present a particular problem.

## German ICE (InterCity Express)

In 1990, the German Federal Railroads are scheduled to begin regular HSR service using the ICE train. Preliminary results (MBB 1987) have shown the noise levels at 82 ft (25 m) from the centerline of the track and at a 11.5 ft (3.5 m) height to be 86 dBA at 124 mph (200 km/h) and 93 dBA at 186 mph (300 km/h).

The 7-dBA difference represents a  $40 \log V_f/V_o$  relationship for the amplitude, similar to the previous relationship for the TGV. Typical noise spectra indicate that the frequency content is only slightly changed by the train speed (Barsikow and Muller 1985). Barsikow and Muller do show that a typical passby is much more influenced by wheel/rail noise than any other noise. As with the French and Japanese, an effort has been made to develop a smooth-riding bogie, which would help to reduce the major noise source.

The interior noise, or those levels expected to be experienced by the passenger, is also a concern. Levels between 60–75 dBA are typical. For example, the ICE interior noise levels have been reported at the center of the car to be 63 dBA at 124 mph (200 km/h) and 73 dBA at 186 mph (300 km/h) and above the bogie, 67 dBA at 124 mph (200 km/h) and 72 dBA at 186 mph (300 km/h) (MBB, personal communication, 1987).

## MagLev

The magnetic levitation and movement of a train would seem to be ready for implementation after completion of the large-scale trials at the Transrapid test facility (TVE) in Germany. Also, in Japan, at the Miyazaki Prefecture, Kyushu, test track, MagLev test vehicles have travelled at 323 mph (517 km/h).

MagLev eliminates the major noise contributor for HSR, the wheel/rail noise. However, at slow speeds, MagLev designs generally use wheels; thus, some rolling noise would still occur. In addition to the elimination of the wheel/rail noise, the MagLev train eliminates catenary noise and has few moving parts. Accordingly, at high speed, the predominant noise becomes only the aero-acoustic disturbance.

Without these major noise sources, levels are dramatically less than all other HSR systems at similar speeds. Levels at 82 ft (25 m) from the centerline of the track have been reported as (Gaymann et al. 1985) 69 dBA at 62 mph (100 km/h), 70 dBA at 124 mph (200 km/h), 82 dBA at 155 mph

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(250 km/h), 84 dBA at 186 mph (300 km/h), and 95 dBA at 248 mph (400 km/h).

Of note here is the small change in noise levels between 62 and 124 mph (100–200 km/h) and the dramatic increase above 124 mph (200 km/h), primarily due to aerodynamic phenomena. Also, no constant mathematical relationship is apparent since the primary noise source changes from wheel/rail interaction at low speeds to aerodynamic effects. Accordingly, MagLev noise levels would not be modeled accurately by using a single logarithmic equation as for the other rail systems but would require a “step” function. More data are needed to properly establish a prediction model for MagLev.

Also interesting is a reported value of 65 dBA at one meter from a stationary vehicle, giving a good feel for the cooling fan and electric hum noise. Noise levels inside the TVE train were reported to be 60 dBA at 248 mph (400 km/h).

Use of the MagLev design would virtually eliminate the need for noise mitigation measures for the speeds under 124 mph (200 km/h) that would be expected in urban areas.

#### Substation Noise

HSR electric systems most generally have electric substations to regulate and change the voltage supply. These are usually required at regular intervals along the track to supply the needed voltage correctly. For example, the TGV does not have any spacing greater than 55.9 mi (90 km) on the new Atlantic line. These substations require large cooling fans to prevent overheating. A study of electric substation noise resulted in an average noise level of 56 dBA at property lines (Keast 1981). When compared to the reported average state noise regulations (Keast 1981), the typical substation would require 14 dBA of noise reduction in residential areas. This impact must be considered in the environmental analysis.

#### Other Considerations

Each proposed project may have unique problems such as tunnel noise and reflective noise. Each project must be carefully considered to not overlook a possible problem area not described here.

#### AIR POLLUTION

##### Air Pollution of Conventional Rail and Air Traffic

Unlike noise, air quality aspects of HSR can be compared for both of its primary competing mass transportation modes, conventional rail passenger service and the airlines. Conventional rail here refers to diesel and electric operations less than 125 mph (201 km/h). These comparisons are normalized by determining energy usage, and resultant emissions, per passenger-mile (or passenger-kilometer) for each mode. Emissions from existing diesel and electric locomotive operations are compared to airlines and discussed in the following. Only the pollutants of primary importance are discussed and only at cruise conditions as described later.

##### Diesel Locomotive Operations

Number 2 diesel fuel, commonly used for existing diesel operations, has an average heating value of  $1.35 \times 10^7$  BTU/gal ( $3.76 \times 10^4$  kJ/L) (Way-

TABLE 1. Air Pollutants Emitted from Transportation Systems (Basis: One Passenger-Mile: 50% Load Factor)

System (1)	Fuel type (2)	Fuel amount required (3)	POUNDS OF EMISSIONS $\times 10^{-3}$					
			Uncontrolled				With Controls <sup>a</sup>	
			PM <sup>b</sup> (4)	CO (5)	HC <sup>c</sup> (6)	NO <sub>x</sub> (7)	PM (8)	NO <sub>x</sub> (9)
Conventional diesel rail	#2 diesel	0.0462 gal	1.16	6.02	4.39	17.28	—	—
Conventional electric rail	Coal (bituminous)	0.472 lb	16.9	0.472	0.235	3.54	0.169	3.01
Japanese shinkansen	Normal gas	5.5 cu ft	0.056	0.995	0.8056	3.92	—	3.23
	Fuel oil	0.039 gal	0.39	0.195	0.039	4.10	0.0009	3.48
	Coal (bituminous)	0.138 lb	4.95	0.138	0.069	1.037	0.059	0.881
	Normal gas	2.460 cu ft	0.025	0.502	0.2025	1.722	—	1.464
TGV	Fuel oil	0.0171 gal	0.171	0.086	0.017	1.801	0.0017	1.531
	Coal (bituminous)	0.107 lb	3.844	0.107	0.054	0.805	0.0384	0.584
	Normal gas	1.274 cu ft	0.0127	0.0216	0.0113	0.892	—	0.738
	Fuel oil	0.009 gal	0.0887	0.0444	0.0089	0.933	0.00089	0.793
TVE <sup>d</sup>	Coal (bituminous)	0.415 lb	14.87	0.415	0.208	3.114	0.149	2.647
	Normal gas	4.526 cu ft	0.0453	0.884	0.3649	3.448	—	2.921
	Fuel oil	0.0343 gal	0.343	0.172	0.0343	3.607	0.0034	3.066
MD-80 aircraft	JP4	0.162 lb	0.422	0.227	0.08	1.08	—	—

<sup>a</sup>Control technology efficiencies assumed: PM (99%); NO<sub>x</sub> (15%).

<sup>b</sup>PM = Particulate matter, 5.50 of ash assumed.

<sup>c</sup>HC = Hydrocarbons, as CH<sub>4</sub>.

<sup>d</sup>Control not required.

<sup>e</sup>At 250 mph (400 km/h).

Note: 1 lb = 0.454 kg; 1 cu ft = 28.3168 L; 1 gal = 3.785 L.

son 1985). A typical value for diesel/electric passenger service energy efficiency can be estimated as approximately 6,300 BTU/pass-mi (4,131 kJ/pass-km) if typical seating and weight factors are used (Morlok 1978). This equates to  $4.67 \times 10^{-2}$  gal of diesel fuel for every passenger for each mile traveled (0.11 L/pass-km).

The air pollutant emissions per passenger-mile can then be computed by using EPA emission factors (USEPA 1983). The factors and emitted amounts are shown in Table 1. The data provide a basis for comparison in environmental analyses and benefit descriptions.

##### Rapid-Rail Electric Transit

Rapid-rail electric transit consumes from 4 BTU/passenger-mile (88 kJ/pass-km) up to 5,760 BTU/passenger-mile (3,777 kJ/pass-km) according to the system used (Vuchic 1981). To form a fair comparison, a mean value for the rapid rail transit of 2,950 BTU/passenger-mile (1,934 kJ/pass-km) was selected for use in this paper. During environmental analysis, the analyst may prefer other values within these large ranges depending on the specific situation.

The calculation of fuel requirements and air pollutants from electric systems is not as straightforward as for diesel. This is because of the way the power (electricity) may be generated. One of several fuels or potential sources may be used. This is a tremendous benefit for HSR: electric operations allow a choice of any conventional energy source to generate the electricity. While economics come into play, the fuel source may be selected from a large variety, not just from petroleum products.

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For example, if nuclear, hydroelectric, geothermal, tidal, or wind power is used, the air pollutants are almost negligible (barring a nuclear disaster). This is a strong point—transportation with very little air pollution. It is being used in France where nuclear power is prevalent.

If natural gas, fuel oil, or coal is used, then the power plant pollutants emitted for the required rail energy are attributable to the electric rail line. However, this again is a relative benefit for electric rail operations because the power plant may be located away from urban areas, and pollutants are much easier to control from one stationary source rather than several mobile sources.

To calculate the amount of energy required for electric rail service, some assumptions must be made. First, the power plant does not have 100% conversion of energy sources to electricity. A value of 40% efficiency is good by present standards (Wayson 1985). Also, line loss robs another 10%. So the energy that arrives at the substation and finally to the electric engine requires 1.85 times, or roughly twice, that amount of energy to be generated at the power plant. This means that for the mean energy efficiency for rapid-rail transit of 2,950 BTU/passenger-mile (1,934 kJ/pass-km), a total of 5,400 BTU/passenger-mile (3,541 kJ/pass-km) of fuel must be burned at the power plant.

This energy equates to different amounts of coal, gas, or fuel oil being used, each with their own EPA emission factors. Table 1 shows the amount of fuel required and pollutant amounts for conventional electric rail operation.

Also shown by Table 1 is another benefit, the degree of achievable pollution abatement at electric power plants. Typically, control efficiency percentages are 15% for nitrogen oxides and 99% for suspended particulate matter (Wayson 1985). With control technology used for particulate matter (PM), all releases are much less than those for diesel operations.

#### Airline Emissions

The calculation of airline emissions is similar to that of diesel operations. As with rail, fuel use by aircraft varies considerably with different types. To provide a fair evaluation, a new, fuel-efficient jet, the MD-80, was selected for comparison. This craft is touted as a member of the new age of aircraft and so provides an excellent comparison for the new age of rail, the HSR. Only the cruise mode of the aircraft was compared to HSR operations. This mode represents the great majority of the aircraft operation time. Taxi and takeoff vary considerably from airport to airport. Accordingly, comparing the cruise mode and associated emission per passenger-mile (or kilometer) of each alternative provides a better comparison basis.

The fuel use of the MD-80 is given as 1.926 lb/sec (0.87 kg/s) [Krull (FAA), personal communication, 1986]. With a capacity of 139–172 passengers and a 50% load factor, the MD-80 has an energy efficiency on the order of 0.162 lb/passenger-mile (0.046 kg/pass-km) for a speed of 550 mph (885 km/h). The FAA has determined air pollutant emission factors for this engine type (JT8D-209) at an 80% throttle setting (cruise) (Wayson and Bowthby 1987). Table 1 shows the amount of fuel required and emitted pollutant amounts. These values, based on energy/passenger-mile (kilometer), provide good numbers for comparison. It should be noted that more

fuel is required per passenger-mile for aircraft than rail and, thus, emissions are greater.

#### Air Pollution from HSR Systems

The calculation of air pollutants for electric HSR operations is the same as for conventional rail operations, except the energy demands change. For instance, an energy consumption value of 864 BTU/passenger-mile (567 kJ/pass-km) is reported for the Japanese Shinkansen for a 50% load factor (JNR 1984). For the French TGV, the energy consumption is only 671 BTU/passenger-mile (440 kJ/pass-km) for the same load factor (Bergouignan, personal communication, 1986). The TVE MagLev train has an energy requirement ranging from 1,090 BTU/passenger-mile (715 kJ/pass-km) at 99 mph (160 km/h) up to 2,595 BTU/passenger-mile (1,702 kJ/pass-km) at 248 mph (400 km/h) (Gaymann et al., 1985). As before, roughly twice this energy requirement must be used at the electric power plant due to inefficiencies and line loss.

The pollutants released for these HSR systems are tabulated in Table 1. As shown, the air pollution emitted from HSR operations (for the same passenger-miles) is less than for aircraft, diesel rail, and existing North American electric operations. Accordingly, this is a benefit of HSR operations.

It should be noted that the comparison is made on a total pollutant load basis, as is commonly used in emission inventories or preliminary environmental documents. Health effects should be calculated based on concentration, which is a function of release rates and dispersion. Dispersion depends on the geometrics of location, weather parameters, reactivity of release, and background concentrations. Accordingly, the analyst must use an appropriate dispersion model if more than a comparison of total pollutants emitted is required.

Another environmental hazard that must also be considered from HSR electric operation is electromagnetic radiation. Electromagnetic radiation and catenary arcing problems have been reported (Mitchell 1985) to: (1) Introduce noise in the signal and communications lines parallel to the railroad; (2) induce high voltage on electrical components near the wayside, which causes a potential hazard; (3) possibly cause certain health problems; (4) induce current flows in conductors that are in ground contact near the railroad causing erosion and potential hazards; and (5) cause radio frequency interference.

#### CONCLUSIONS

The data presented here provide guidance for a knowledgeable analyst to prepare an environmental document for a high-speed rail system. Also described are the environmental benefits that HSR has to offer over other conventional intercity mass-transportation systems, which include: (1) Less air pollution per passenger-mile than any other intercity mass transportation system except where coal is used and air pollution is emitted in similar amounts; (2) a single, well-controlled source instead of many uncontrolled sources; (3) a choice of fuels; (4) less noise at similar speeds than conventional rail; (5) no horn noises; and (6) available, effective noise control methods.

Some of these benefits can be significant, as with the French TGV system where nuclear power is the source and the transportation mode emits vir-

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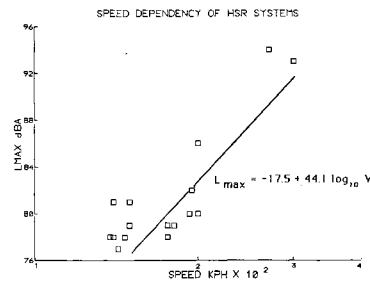


FIG. 6. Normalized HSR At-Grade Data; Distance = 30 m

tually no air pollutants. The use of noise abatement walls can reduce the relatively low noise levels by as much as 25 dBA. The "down-side" scenario is that power plants could cause higher concentrations at a given point. However, if properly sited, this problem is easily solved.

Of course to complete the environmental document procedure, predictive models must be available. In the case of air pollution, emission factors have been developed (USEPA 1983), and dispersion modeling of line and point sources are well documented. However, no good predictive tool has been developed for HSR noise. Least-mean square analysis has been used in the past to develop logarithmic equations relating maximum A-weighted noise levels for conventional systems with considerable success. This approach can also be used for HSR.

Fig. 6 shows data previously presented but normalized for a distance of 100 ft (30 m). All data presented are for at-grade unshielded conditions. For these HSR data, a good equation ( $r = 0.859$ ) can be developed:

$$L_A = -17.5 + 44.1 \log V, \quad \text{where } V \text{ is in km/h} \quad (6)$$

This equation, although based on a small data base, should provide a basis for preliminary environmental studies. Of course, where possible, calibration of the model would allow for a more accurate analysis. Also, this model predicts the maximum A-weighted noise level. For environmental documents, a time-averaged value would be required. This could be developed by knowing the number of trains and time required to pass a given point.

The ratio of initial speed to final speed also follows a logarithmic function. If  $V_i$  is known, a  $40 \log (V_f/V_i)$  relationship could allow an approximate prediction of the expected high-speed noise level increase.

Geometric spreading must also be considered. From data presented, it appears an HSR system should be modeled somewhere between a line source

(3 dBA per doubling of distance fall-off rate) and a point source (6 dBA per doubling of distance). A value of 4.5 dBA could be acceptable. Excess ground attenuation must also be considered for at-grade situations and grassy ground cover. Geometric spreading has more effect on overall noise levels than do changes in speed.

It should be noted that MagLev and other electric modes cannot be modeled with a simple logarithmic equation as used for other rail sources. More data are required before a predictive model can be developed.

New concerns that cannot be omitted from an environmental analysis are the electromagnetic radiation problems and noise from electric substations. However, with proper design and placement, these problems could be minimized.

This paper should assist in preparation of environmental documents on HSR systems. Air pollution factors presented here could be used directly in environmental documents. However, further research is required to supply the analyst with better predictive tools for noise.

#### APPENDIX I. REFERENCES

- "Advanced prediction and abatement of highway traffic noise." (1982). *Lecture Notes and Training Course Manual*. U.S. Dept. of Transportation, Federal Highway Administration, Washington, D.C.
- Arai, M., and Yoshio, B. (1975). "Noise control for Shinkansen railways." *Inter-noise '75 Proc.*, Sendai, Japan.
- ASCE Subcommittee on High Speed Rail. (1985). "High-speed rail systems in the United States." *J. Transp. Engrg.*, ASCE, 111(2), 79-94.
- Barsikow, B., and Muller, B. (1985). "A detailed study of the vertical distribution of noise sources generated by a high-speed train." *Inter-Noise '85 Proc.*, Munich, FRG.
- Blenchmann, F. (1985). "Results from noise and vibration research for urban railways." *Inter-Noise '85 Proc.*, Munich, FRG.
- "Compilation of Air Pollutant Emission Factors." (1983). *Report AP-42*, 14th Ed., U.S. Environmental Protection Agency, Office of Air Programs, Research Triangle Park, N.C.
- "Les Effets sur L'Environnement de la Ligne Nouvelle TGV Park/Sud-Est." (1983). SNCF, Cete de Lyon, France.
- Gaymann, T., Rahu, T., and Abraham, R. (1985). "Riding or flying?" *MVP Technical Brochure*, Munich, FRG.
- Goding, D. L. (1980). "Diesel-electric locomotive noise control." *Inter-Noise '80 Proc.*, Miami, Fla.
- Hanson, C. E. (1976). "Environmental noise assessment of railroad electrification." *Inter-Noise '76 Proc.*, Washington, D.C.
- Hanson, C. E. (1977). "Noise from high speed trains in the Northeast Corridor." *Noise-Con '77 Proc.*, Hampton, Va.
- Hidehiko, A., and Masaki, A. (1978). "Noise control of steel railway bridges in Shinkansen." *Inter-Noise '78 Proc.*, San Francisco, Calif.
- ICE technical data intercity experimental. (1987). MBB-Transportation Technology, Arlington, Va.
- Japan Environment Agency (JEA). (1985). "Further measures for achieving environmental quality standards for Shinkansen railway noise." *Japan Envir. Sum.*, 13(12).
- Keast, D. N. (1981). "Electrical substation design practice in the United States and its influence on transformer noise in surrounding communities." *Inter-Noise '81 Proc.*, Amsterdam, The Netherlands.
- Matsumita, H., and Shibata, T. (1975). "The characteristics of noise caused by the high-speed railways." *Inter-Noise '75 Proc.*, Sendai, Japan.

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- Mitchell, M. B. (1985). "High-speed passenger train safety." *Transportation Research Record 1023*, Transportation Research Board, Washington, D.C.
- Moriok, E. K. (1978). *Introduction to transportation engineering and planning*. McGraw-Hill, New York, N.Y.
- Nimura, T., et al. (1975). "Estimation of noise radiated from the Shinkansen railway." *Inter-Noise '75 Proc.*, Sendai, Japan.
- Nimura, T., Ebata, M., and Takahashi, T. (1976). "Estimation and consideration of the Shinkansen noise for a newly established line (New Tohoku Line)." *Inter-Noise '76 Proc.*, Washington, D.C.
- \*"Railroad classification yard technology; noise control." (1981). *FRA/ORD-31/18*, U.S. Dept. of Transportation, Federal Railroad Administration, Washington, D.C.
- Remington, P. J. (1976). "Wheel/rail noise, Part 1: Characterization of the wheel/rail dynamic system." *J. Sound Vib.*, 46(3).
- Shinkansen. (1984). *Japanese National Railways (JNR), International Department*. Tokyo, Japan.
- Smith, G. C., and Shirley, E. (1987). "High speed rail in California: The dream, the process, and the reality." Paper presented at the 66th Annual Transportation Research Board Meeting, Washington, D.C.
- Stusnick, E. (1984a). "Issues in transportation noise mitigation: highway and railway studies." *Transportation Research Record 983*, Transportation Research Board, Washington, D.C.
- Stusnick, E. (1984b). "Review of federal noise emission standards for interstate rail carriers." *Transportation Research Record 983*, Transportation Research Board, Washington, D.C.
- Vernet, M. (1984). "High-speed trains." International Seminar in Paris, France.
- Virchie, V. R. (1981). *Urban public transportation systems and technology*. Prentice-Hall, Englewood Cliffs, N.J.
- Wayson, R. L. (1985). "The air pollution of railroad electrification in eastern Texas," thesis presented to the University of Texas at Austin, Tex., in partial fulfillment for the requirements for the degree of Master of Science.
- Wayson, R. L., and Bowley, W. (1987). "Inventorying airport air pollutant emissions." *J. Transp. Engrg.*, to be published, 1988.
- Wilson, G. P. (1977). "Rail transit system noise control." *Noise-Con '77 Proc.*, Hampton, Va.

## APPENDIX II. NOTATION

The following symbols are used in this paper:

- dBA = decibels on A-weighted scale (reference =  $2 \times 10^{-5}$  N/m<sup>2</sup>);
- $L_A$  = maximum A-weighted sound level;
- $r$  = correlation coefficient;
- $V$  = speed (mph);
- $V_f$  = final speed (km/h); and
- $V_e$  = initial speed (km/h).

## NOISE AND AIR POLLUTION OF HIGH-SPEED RAIL SYSTEMS\*

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(Reviewed by the Urban Transportation Division)

**ABSTRACT:** Transportation noise and air pollution problems are a nemesis to our modern society. Each transportation system, high-speed rail (HSR) included, has its own noise spectra, characteristic air pollutant emissions, and particular environmental problems. This paper presents a review of noise levels from different types of European and Asian high-speed rail systems. Also presented is a comparison of associated air pollutant emissions. Comparisons of the European and Asian HSR noise levels are made with diesel rail propulsion, rapid-rail transit, and existing rail noise standards. This permits a review of how HSR noise might affect the surrounding community since these systems are not yet operational in the United States. Noise abatement for high-speed rail systems is also discussed. High-speed rail relies on electric propulsion. Accordingly, the only air pollutants directly emitted are by the wheel bearings, freight, and/or entrained dust, all of which are generally insignificant. However, the power required of the electric power plant and the subsequent release of air pollutants at the plant must be considered to be attributable to the high-speed rail system. The paper includes comparison of these releases with the air pollutants emitted by diesel locomotives and a typical aircraft. Finally, conclusions on the prediction of total air pollutant load and noise levels for high-speed rail are discussed.

## INTRODUCTION

High-speed rail (HSR), which has been defined by the American Society of Civil Engineers (ASCE) as being greater than 125 mph (201 km/h), has been developed in Europe and Asia for quite some time (ASCE 1985). However, HSR has yet to be developed in the United States. The Northeast Corridor portion of the Amtrak system, with speeds as high as 120 mph (193 km/h), is the closest system the U.S. has to an HSR system, although several systems have been proposed.

Environmental concerns such as air quality and noise are high on the list of possible problem areas for these proposed systems. The National Environmental Policy Act (NEPA) requires any federally funded or federally involved project to have performed an environmental analysis. However, as was learned with a planned project in the Los Angeles-San Diego corridor (Smith and Shirley 1987), even privately funded HSR projects will usually require an environmental assessment. Accordingly, environmental document preparation must be considered an integral part of the preliminary engineering of any HSR system. Proper prediction tools must be developed to evaluate HSR.

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HSR is in direct competition with other modes of intercity mass transportation. Because of this, HSR must show benefits over competing modes in order to be implemented. Because of the high capital costs associated with track restructuring and other required tasks, economics, at least in the short run, cannot usually be shown to be a benefit. Accordingly, other HSR benefits must justify HSR over implementation of other modes of transportation for the project to be feasible. One such benefit is the area of environmental considerations.

This paper will present information that should be of help to those individuals involved in this environmental process. First, for comparative purposes, noise and air pollution characteristics of conventional intercity transportation modes in North America, diesel-powered rail, rapid-rail transit, and aviation, are described. Intercity buses were not considered because of the poor comparison to HSR and since by their nature they are prone to emit greater amounts of pollution on a passenger-mile basis. Then the same characteristics are presented for HSR systems in use elsewhere throughout the world. Vibration, another important topic, is not discussed in this paper. Finally, a guide for predictive modeling of noise and air quality is presented.

#### Noise

##### Noise of Conventional North American Rail Systems

A basis for comparison of HSR noise levels may be established by examining existing conventional North American intercity transportation systems. Although HSR operations are probably more in competition with airlines than other railroads, comparisons of noise emission levels of HSR and aviation are of little practical use because of spatial variations in aircraft flight paths. A more practical noise level comparison is between HSR and conventional rail operations. To provide these comparisons, noise levels from existing HSR, diesel, and rapid-rail systems have been compiled in this paper, as well as data from the Northeast Corridor system and federal noise standards. These data are discussed separately below.

##### Diesel Operations

Noise from diesel operations is made up of two primary sources: the locomotive engine and the wheel/rail interaction.

Locomotive engine noise is composed of three dominant sources: engine exhaust, engine crankcase, and electric radiator cooling fans. Tests by General Motors show the cooling fan noise to be significant (Goding 1980). Maximum "A-weighted" noise levels for three typical pre-1980 engine types at 100 ft (30 m) from the centerline of the tracks vary from 67 dBA at idle to 89 dBA at full throttle (Goding 1980). ("A-weighted" noise levels represent a weighted composite of the entire noise spectrum.) Cooling fan operation is shown to increase these levels by an additional 1–2 dBA. Of note is that an approximate 20-dBA increase occurs from idle to full throttle. Other studies have determined exhaust noise levels to be 86–94 dBA at 100 ft (30 m), noise from engine casing 80–86 dBA, and cooling fan noise from 80–84 dBA (Hanson 1976).

Exhaust silencers were used after 1979 due to federal legislation. The spectra for two of the three engine types are shown in Fig. 1 (Goding 1980). The effects of the silencers on the post-1979 locomotives should be noted. For

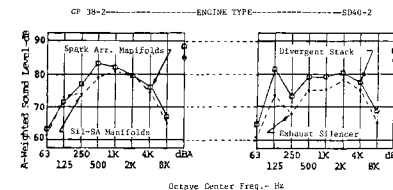


FIG. 1. Noise Reduction Silencer/Spark Arrestor Manifolds on GP38-2 and SD40-2; 30 m. Stationary, Full Load, Fans Off [from Goding (1980)]

example, the A-weighted noise levels for the GP38-2 and SD40-2 engines were reduced by 3 dBA. Also of note are the sharp fall-off of noise levels below 125 Hz and over 8 kHz. The peak at 125 Hz is caused by the predominant 120 Hz firing frequency; thus, the silencers are tuned expansion chambers for this frequency.

Radiator cooling fan noise also had to be considered. If the federal standards (presented later) were to be met, this noise source had to be quieted also. To accomplish this goal, a redesign of the fan inlet assembly was required. The newer fans were 8 dBA quieter (approximately 77 dBA). Since sound levels are combined logarithmically, the new reduced fan noise added little to the total A-weighted levels, which remained essentially as shown by Fig. 1.

Wheel/rail noise is another consideration and is dependent on many parameters. Wheel/rail noise will vary dramatically according to type of wheel/bogie and rail/track structure (Remington 1976; Fischer 1976). Curve squeal may also occur from lateral sliding of the wheels caused by a stick-slip process (Bienenmann 1985), but for the purpose of this paper and the difficulty of prediction, will not be considered here. To be considered is that wheel/rail noise is a function of speed. Fig. 2 shows noise emission factors that have been developed for typical rail cars (USDOT 1981, 1982). It is interesting to note the much greater speed dependence associated with the 1982 study. The logarithmic relationship is very noticeable.

The maximum A-weighted sound level of many passbys has also been correlated (Stansick 1984b). The data scatter should be noted ( $r = 0.520$ ) for the best-fit least-squares line, but the data do provide a basis for comparative purposes and permits an equation to be developed. The equation is:

$$L_A = 11.09 \log V + 70.8 \quad (1)$$

where  $L_A$  = maximum A-weighted sound level, and  $V$  = speed in mph. This empirically based prediction provides a basis to estimate noise emissions for diesel operations. It should be noted that the noise level is proportional to the logarithm of the velocity.

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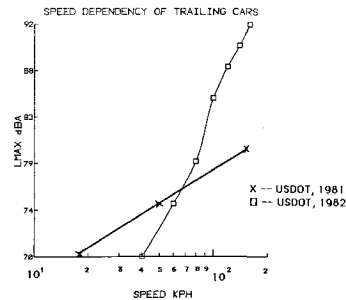


FIG. 2. Noise from Trailing Cars, Conventional Rail [data from USDOT (1981, 1982)]

**Rapid-Rail Transit**

Rapid-rail transit, a passenger-oriented service, is also dominated by two noise sources, the on-board electric engine and wheel/rail interaction. However, the gross tonnage is much less than that of diesel or freight operations. Thus, the smaller horsepower requirements and electric engine result in less noise from the engine source. The overall train is lighter, closer to the ground, and usually has smoother track and rail conditions. This causes the wheel loading to be less and the wheel/rail noise to be less. The lower noise-source height can also be more easily attenuated by the terrain, decreasing noise levels further. Accordingly, noise levels are generally less for rapid-rail transit than for diesel operations at comparable speeds. For example, the noise level for San Francisco Bay Area Transit System trains at 60 mph (97 km/h) and 50 ft (15 m) is approximately 82 dBA. The Washington D.C. Metro system noise levels at 60 mph (97 km/h) are approximately 83 dBA. The Chicago Transit Authority noise levels are approximately 80 dBA (Wilson 1977). These values of 80–83 dBA at 50 ft (15 m) are much less than the value reported for diesel operations, full throttle, at 100 ft (30 m) [97 dBA, when corrected to 50 ft (15 m)]. Damped wheels can reduce the reported noise levels by 1–2 dBA.

**Northeast Corridor**

The closest implementation to HSR in North America is the Northeast Corridor Improvement Program. This rapid-rail system is capable of speeds up to 120 mph (193 km/h), and faster speeds were originally hoped for by 1990. The service evaluation tests for this system were conducted on two high-speed locomotive types, the General Electric E-60CP and the Swedish ASEA RC4 (Hanson 1977). The tests were made at speeds ranging from

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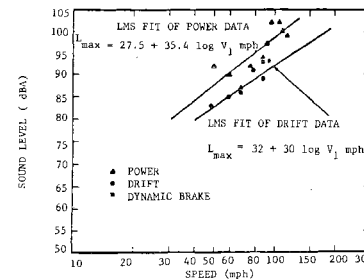


FIG. 3. General Electric E-60 Passby Levels:  $L_{max}$  at 15 m [from Hanson (1977)]

50–120 mph (80–193 km/h). The continuous welded rails were tie and ballast. The results for the E-60CP engine, for both drift and power, are shown by Fig. 3. Note the equations on the figure are

Drift  

$$L_A = L_{max} = 32 + 30 \log V, \quad \text{where } V \text{ is in mph} \quad (2)$$

Power  

$$L_A = L_{max} = 27.5 + 35.4 \log V, \quad \text{where } V \text{ is in mph} \quad (3)$$

The ASEA RC4 results are not shown, but are similar to the E-60CP engine. The derived equations were

Drift  

$$L_A = 37 + 27 \log V, \quad \text{where } V \text{ is in mph} \quad (4)$$

Power  

$$L_A = 23 + 34.5 \log V, \quad \text{where } V \text{ is in mph} \quad (5)$$

The logarithmic effect of speed on each is noteworthy. Although the testing was limited to one vehicle of each type, it can easily be concluded that the noise levels from these electric locomotives were a definite improvement over existing diesel operations noise levels.

The trailing car noise would be very similar to those results shown for rapid-rail transit, allowing for the speed-dependent characteristics of wheel/rail noise.

**Federal Rail Noise Standards**

The Noise Control Act of 1972 provided authorization to establish federal noise emission standards for products distributed in commerce and required the Environmental Protection Agency (EPA) to promulgate standards. The

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USDOT was required to draft compliance regulations limits on "noise emission resulting from operation of the equipment and facilities of surface carriers engaged in interstate commerce by railroad." The compliance regulations required noise analysis to be conducted, and feasible noise reduction measures to be implemented. Though initially issued on December 31, 1975, full implementation did not occur until January 15, 1984 (Stusnick 1984).

The standards regulated the two noise sources of a train passby (locomotive and wheel/rail noise) as well as yard and equipment sources (Stusnick 1984). The standard of concern here is for locomotives built after December 31, 1979, which at 100 ft (30 m) should not exceed 90 dBA ( $L_{max}$ ) for moving conditions. The standards reflect noise levels greater than expected from even existing diesel operations and so are only meant to stop incorrectly operating diesel engines. Trailing cars are regulated according to speed. This corresponds to an allowance for wheel/noise dependency and engine throttle settings.

The previous discussion shows that diesel operations have a larger amplitude than rapid-rail transit or the Northeast Corridor trains at similar speeds. These systems should provide an excellent comparison to HSR in environmental documents.

#### Noise of HSR Systems

Complete information on the full range of HSR systems, which include diesel/electric operations, turbine-powered locomotives and electric-powered locomotives, must be gathered outside the United States. For example, the British run an HSR service using diesel/electric locomotive propulsion. However, this system was thought not to be of a type that would be used in pending North American HSR projects and so was not evaluated in this paper. Similarly, turbine-powered trains, which are reported by ANF-Industrie (France) to be on the verge of high-speed operations, do not seem to be under consideration by any North American projects and thus were not reviewed. An electric HSR locomotive with possibilities for the future is the Canadian LRC, but it is not discussed herein due to inconclusive data; likewise the HSR in Italy was not reviewed.

The electric HSR locomotives that were reviewed included the Japanese Shinkansen, the French TGV (Trains à Grande Vitesse), the German ICE (InterCity Express), and MagLev (Magnetic Levitation) designs. Each of these systems are on the same order of size as the electrically powered vehicles described for rapid-rail transit with the exception of MagLev, which is experimental. Thus, noise levels are similar for electric operations of both, allowing for speed-dependent characteristics. Wheel/rail interaction is the most intense noise source for electric HSR operations as compared to the dominance of locomotive engine noise for diesel rail operations (Arai and Yoshio 1975). One benefit of HSR is that the absence of at-grade crossings eliminates horn noise.

#### Japanese Shinkansen

The first HSR to begin service was the Tokaido Shinkansen in 1964. Since that time the Sanyo and Shinkansen have begun service and six other lines are planned (JNR 1984). The long time in service of these HSR systems has allowed more noise data to be collected than on the newer or experimental lines.

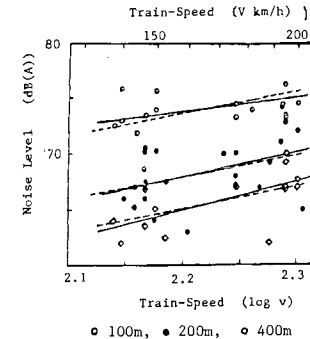


FIG. 4. Relation between Train Speed and Noise Level: Solid Lines Represent Estimated Relations at Each Distance and Broken Line Represents Average [from Matsuhisa and Shibata (1975)]

The effects of distance and speed on HSR noise levels must be considered. Fig. 4 shows an excellent graphic of these effects (Matsuhisa and Shibata 1975). Noise levels range from 62 dBA [1,312 ft (400 m), 118 mph (190 km/h)] to 76 dBA [328 ft (100 m), 124 mph (200 km/h)]. Of note are the following:

1. The noise level does not decrease linearly for each doubling of distance as would be expected (probably due to ground impedance).
2. Geometric spreading has much more effect on the noise levels at high speed than does changes in speed (noise levels are influenced more by distance than changes in speed).
3. The noise level measurements are correlated with the logarithm of speed.

The Shinkansen noise levels from various geometric designs were reported by Arai and Yoshio (1975). The work included measurement of noise levels at 82 ft (25 m) from the track centerline with a receiver height of 3.9 ft (1.2 m) above ground from various site conditions. The Shinkansen trains have 12-16 cars. Fig. 5 shows the noise spectra results and the overall A- and C-weighted noise levels for four cases with a train speed of 124 mph (200 km/h): a bridge situation, a viaduct, on an embankment, and in a cut. Of note are the strong low-frequency components for the bridge and viaduct, apparently from structure-radiated noise. The levels in the cut show the ef-

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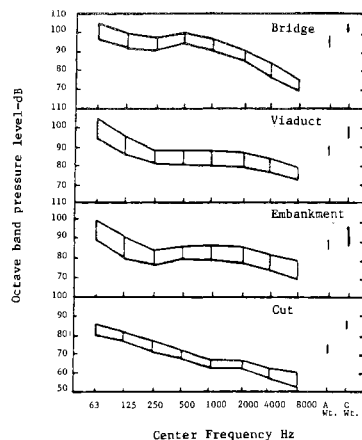


FIG. 5. Noise Spectra at Key Points; 200 km/h [from Arai and Yoshio (1975)]

fectiveness of the cut in blocking the sound propagation path. From Fig. 5, it is shown that geometric design can be used as a noise mitigation strategy.

Noise barriers are also a good way to block noise and can be extremely effective when properly designed for HSR systems (Matsuhisa and Shibata 1975). One should note, however, that noise at frequencies below 500 Hz is not as effectively blocked by the barrier due to the longer wavelengths. A thorough study was done by Nimura et al. (1975) for the then-new Japanese Tohoku line. Frequency-dependent spectra were collected for a section of track with noise barriers (Nimura et al. 1975). The overall A-weighted noise level was approximately 80 dBA at 82 ft (25 m). A large part of this was from a third noise source other than locomotive engine or wheel/rail noise, which was identified and shown to be significant due to electrification.

This third source is the current collection device noise (catenary noise) caused by the friction noise from the sliding contact of the pantograph-slider and trolley wire. Arai and Yoshio (1975) note that catenary noise becomes greater in the higher speed ranges because of arc-discharge noise that occurs

due to a chattering phenomenon between the slider and wire. The height of this source makes it difficult to attenuate by noise barriers in a cost-efficient manner.

Nimura later substantiated his earlier work by showing noise levels of 82 and 87 dBA for other Japanese wall configurations at 82 ft (25 m) from an elevated road bed (Nimura et al. 1976). Other findings of importance were that by changing the ballast mat, further reductions in the noise levels may be achieved and care must be taken in the design of noise walls on structure to prevent reradiation of very low frequency noise or "infrasound." (Nimura et al. 1976).

This second finding is evident because the worst noise problems on the Japanese line are reported to occur on steel bridges (Hidehiko and Massaki 1978). However, noise barriers on these structures can be extremely effective, if properly designed. Damping of the main girders and sound absorptive treatment on the inside of the noise barriers are important. The damping reduces structure-borne noise. The absorptive treatment prevents noise reverberation between the barrier and the side of the rail car, which "spills" over the top of the barrier, increasing levels at the receiver. Reductions of up to 25 dBA have been shown for various barrier designs on a line with trains traveling at 99.4 mph (160 km/h) (Hidehiko and Massaki 1978).

These different noise reduction measures have proven to be effective in Japan. In 1985, it was reported by the Japanese Environment Agency that "various measures taken regarding noise sources have considerably reduced the noise level, and noise exceeded 80 dBA at no point excepting steel bridges" (JEA 1985).

A noise level decrease of 18.7 dBA between distances of 41 ft and 328 ft (12.5 m and 100 m) was found for at-grade sections, and 10.1–11.4 dBA was found for viaducts and embankment sections. These decreases show that the reduction due to geometric spreading may change according to site geometry and ground impedance. It can also be concluded that the noise-level fall-off rate could correspond to a line source (3 dBA per doubling of distance) or a point source (6 dBA per doubling of distance) according to the particular site geometry and ground cover. Accordingly, for predictions, a rate between a line source and point source fall-off should be used.

#### French TGV

An operating system that others are often compared to is the French TGV. The ten-car trains (two power cars and eight passenger cars) have an average operating speed of 168 mph (270 km/h) and are capable of speeds over 200 mph (322 km/h). The TGV Atlantique line, scheduled for completion in 1989–1990, will operate at an average speed of 186 mph (300 km/h) (Bergougnan, personal communication, 1986).

Noise levels are also a concern for the French. Between Paris and Lyon, a maximum noise level of 97 dBA at 82 ft (25 m) was reported for a train speed of 169 mph (272 km/h) (SNCF 1983). The track for these loud occurrences was continuously welded, with reinforced concrete ties and crushed stone ballasts. However, despite these high levels, a level of 75 dBA was found to be exceeded at only three homes along the line, primarily due to the wide, dedicated right-of-way.

A study of noise levels measured under the bogie provide an insight to the speed dependency of the TGV (Vernet 1984). This study substantiates

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a previous conclusion for the Japanese Shinkansen that at speeds in the HSR range, the effects of geometric spreading and noise barriers are greater than the effects of speed changes (only a 17-dBA range occurs between speeds of 50 mph and 186 mph (80 and 300 km/h)). This represents a  $30 \log V_f/V_i$  relationship to maximum noise levels, where  $V_f$  = final train speed; and  $V_i$  = initial train speed. Also of note from this study is that a 15-dBA increase in noise could occur if the rail conditions changed from "very good" to "showing signs of rail corrugation." This points out the possible attenuation that may occur from maintaining a very smooth rail.

Besides the experiences with wheel/rail noise, the French have had similar experiences with noise abatement techniques as the Japanese (Bergougnan, personal communication, 1986). Walls and depressed sections have been used effectively in some urban areas, but bridges still present a particular problem.

## German ICE (InterCity Express)

In 1990, the German Federal Railroads are scheduled to begin regular HSR service using the ICE train. Preliminary results (MBB 1987) have shown the noise levels at 82 ft (25 m) from the centerline of the track and at a 11.5 ft (3.5 m) height to be 86 dBA at 124 mph (200 km/h) and 93 dBA at 186 mph (300 km/h).

The 7-dBA difference represents a  $40 \log V_f/V_i$  relationship for the amplitude, similar to the previous relationship for the TGV. Typical noise spectra indicate that the frequency content is only slightly changed by the train speed (Barsikow and Muller 1985). Barsikow and Muller do show that a typical passby is much more influenced by wheel/rail noise than any other noise. As with the French and Japanese, an effort has been made to develop a smooth-riding bogie, which would help to reduce the major noise source.

The interior noise, or those levels expected to be experienced by the passenger, is also a concern. Levels between 60–75 dBA are typical. For example, the ICE interior noise levels have been reported at the center of the car to be 63 dBA at 124 mph (200 km/h) and 73 dBA at 186 mph (300 km/h) and above the bogie, 67 dBA at 124 mph (200 km/h) and 72 dBA at 186 mph (300 km/h) (MBB, personal communication, 1987).

## MagLev

The magnetic levitation and movement of a train would seem to be ready for implementation after completion of the large-scale trials at the Transrapid test facility (TVE) in Germany. Also, in Japan, at the Miyazaki Prefecture, Kyushu, test track, MagLev test vehicles have travelled at 323 mph (517 km/h).

MagLev eliminates the major noise contributor for HSR, the wheel/rail noise. However, at slow speeds, MagLev designs generally use wheels; thus, some rolling noise would still occur. In addition to the elimination of the wheel/rail noise, the MagLev train eliminates catenary noise and has few moving parts. Accordingly, at high speed, the predominant noise becomes only the aero-acoustic disturbance.

Without these major noise sources, levels are dramatically less than all other HSR systems at similar speeds. Levels at 82 ft (25 m) from the centerline of the track have been reported as (Gaymann et al. 1985) 69 dBA at 62 mph (100 km/h), 70 dBA at 124 mph (200 km/h), 82 dBA at 155 mph

(250 km/h), 84 dBA at 186 mph (300 km/h), and 95 dBA at 248 mph (400 km/h).

Of note here is the small change in noise levels between 62 and 124 mph (100–200 km/h) and the dramatic increase above 124 mph (200 km/h), primarily due to aerodynamic phenomena. Also, no constant mathematical relationship is apparent since the primary noise source changes from wheel/rail interaction at low speeds to aerodynamic effects. Accordingly, MagLev noise levels would not be modeled accurately by using a single logarithmic equation as for the other rail systems but would require a "step" function. More data are needed to properly establish a prediction model for MagLev.

Also interesting is a reported value of 65 dBA at one meter from a stationary vehicle, giving a good feel for the cooling fan and electric hum noise. Noise levels inside the TVE train were reported to be 60 dBA at 248 mph (400 km/h).

Use of the MagLev design would virtually eliminate the need for noise mitigation measures for the speeds under 124 mph (200 km/h) that would be expected in urban areas.

## Substation Noise

HSR electric systems most generally have electric substations to regulate and change the voltage supply. These are usually required at regular intervals along the track to supply the needed voltage correctly. For example, the TGV does not have any spacing greater than 55.9 mi (90 km) on the new Atlantique line. These substations require large cooling fans to prevent overheating. A study of electric substation noise resulted in an average noise level of 56 dBA at property lines (Kest 1981). When compared to the reported average state noise regulations (Kest 1981), the typical substation would require 14 dBA of noise reduction in residential areas. This impact must be considered in the environmental analysis.

## Other Considerations

Each proposed project may have unique problems such as tunnel noise and reflective noise. Each project must be carefully considered to not overlook a possible problem area not described here.

## AIR POLLUTION

### Air Pollution of Conventional Rail and Air Traffic

Unlike noise, air quality aspects of HSR can be compared for both of its primary competing mass transportation modes, conventional rail passenger service and the airlines. Conventional rail here refers to diesel and electric operations less than 125 mph (201 km/h). These comparisons are normalized by determining energy usage, and resultant emissions, per passenger-mile (or passenger-kilometer) for each mode. Emissions from existing diesel and electric locomotive operations are compared to airlines and discussed in the following. Only the pollutants of primary importance are discussed and only at cruise conditions as described later.

### Diesel Locomotive Operations

Number 2 diesel fuel, commonly used for existing diesel operations, has an average heating value of  $1.35 \times 10^5$  BTU/gal ( $3.76 \times 10^4$  kJ/L) (Way-

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TABLE 1. Air Pollutants Emitted from Transportation Systems (Basis: One Passenger-Mile; 50% Load Factor)

System (1)	Fuel type (2)	Fuel amount required (3)	POUNDS OF EMISSIONS $\times 10^{-3}$					
			Uncontrolled			With Controls <sup>a</sup>		
			PM <sup>b</sup> (4)	CO (5)	HC <sup>c</sup> (6)	NO <sub>x</sub> (7)	PM (8)	NO <sub>x</sub> (9)
Conventional diesel rail	#2 diesel	0.0662 gal	1.16	6.02	4.39	17.28	— <sup>d</sup>	—
Conventional electric rail	Coal (bituminous)	0.472 lb	16.9	0.472	0.736	2.54	0.169	3.01
	Natural gas	5.5 cu ft	0.056	0.095	0.0056	3.92	— <sup>d</sup>	3.33
	Fuel oil	0.039 gal	0.39	0.195	0.039	4.10	0.0039	3.48
Japanese Shinkansen	Coal (bituminous)	0.138 lb	4.95	0.138	0.269	1.037	0.050	0.881
	Natural gas	2.468 cu ft	0.025	0.042	0.0025	1.722	— <sup>d</sup>	1.464
	Fuel oil	0.0171 gal	0.171	0.086	0.017	1.804	0.0017	1.531
TGV	Coal (bituminous)	0.117 lb	3.844	0.107	0.054	0.803	0.0384	0.584
	Natural gas	1.274 cu ft	0.0127	0.0216	0.0013	0.892	— <sup>d</sup>	0.758
	Fuel oil	0.006 gal	0.0887	0.0444	0.0069	0.933	0.00069	0.793
TVR <sup>e</sup>	Coal (bituminous)	0.415 lb	14.87	0.415	0.708	3.114	0.149	2.647
	Natural gas	4.924 cu ft	0.0093	0.0164	0.0009	3.448	— <sup>d</sup>	2.931
	Fuel oil	0.0363 gal	0.343	0.172	0.0363	3.607	0.0034	3.066
MD-80 aircraft	JP-4	0.162 lb	0.422	0.227	0.038	3.08	0.0034	3.066

<sup>a</sup>Control technology efficiencies assumed: PM (99%), NO<sub>x</sub> (35%).<sup>b</sup>PM = Particulate matter; 5.0% of ash assumed.<sup>c</sup>HC = Hydrocarbon, as CH<sub>4</sub>.<sup>d</sup>Control not required.<sup>e</sup>Control not required.<sup>f</sup>At 250 mph (400 km/h).

Note: 1 lb = 0.454 kg; 1 cu ft = 28.3168 L; 1 gal = 3.785 L.

son 1985). A typical value for diesel/electric passenger service energy efficiency can be estimated as approximately 6,300 BTU/pass-mi (4,131 kJ/pass-km) if typical seating and weight factors are used (Morlok 1978). This equates to  $4.67 \times 10^{-3}$  gal of diesel fuel for every passenger for each mile traveled (0.11 L/pass-km).

The air pollutant emissions per passenger-mile can then be computed by using EPA emission factors (USEPA 1983). The factors and emitted amounts are shown in Table 1. The data provide a basis for comparison in environmental analyses and benefit descriptions.

#### Rapid-Rail Electric Transit

Rapid-rail electric transit consumes from 4 BTU/passenger-mile (88 kJ/pass-km) up to 5,760 BTU/passenger-mile (3,777 kJ/pass-km) according to the system used (Vuchic 1981). To form a fair comparison, a mean value for the rapid rail transit of 2,950 BTU/passenger-mile (1,934 kJ/pass-km) was selected for use in this paper. During environmental analysis, the analyst may prefer other values within these large ranges depending on the specific situation.

The calculation of fuel requirements and air pollutants from electric systems is not as straightforward as for diesel. This is because of the way the power (electricity) may be generated. One of several fuels or potential sources may be used. This is a tremendous benefit for HSR: electric operations allow a choice of any conventional energy source to generate the electricity. While economics come into play, the fuel source may be selected from a large variety, not just from petroleum products.

For example, if nuclear, hydroelectric, geothermal, tidal, or wind power is used, the air pollutants are almost negligible (barring a nuclear disaster). This is a strong point—transportation with very little air pollution. It is being used in France where nuclear power is prevalent.

If natural gas, fuel oil, or coal is used, then the power plant pollutants emitted for the required rail energy are attributable to the electric rail line. However, this again is a relative benefit for electric rail operations because the power plant may be located away from urban areas, and pollutants are much easier to control from one stationary source rather than several mobile sources.

To calculate the amount of energy required for electric rail service, some assumptions must be made. First, the power plant does not have 100% conversion of energy sources to electricity. A value of 40% efficiency is good by present standards (Wayson 1985). Also, line loss robs another 10%. So the energy that arrives at the substation and finally to the electric engine requires 1.85 times, or roughly twice, that amount of energy to be generated at the power plant. This means that for the mean energy efficiency for rapid-rail transit of 2,950 BTU/passenger-mile (1,934 kJ/pass-km), a total of 5,400 BTU/passenger-mile (3,541 kJ/pass-km) of fuel must be burned at the power plant.

This energy equates to different amounts of coal, gas, or fuel oil being used, each with their own EPA emission factors. Table 1 shows the amount of fuel required and pollutant amounts for conventional electric rail operation.

Also shown by Table 1 is another benefit, the degree of achievable pollution abatement at electric power plants. Typically, control efficiency percentages are 15% for nitrogen oxides and 99% for suspended particulate matter (Wayson 1985). With control technology used for particulate matter (PM), all releases are much less than those for diesel operations.

#### Airline Emissions

The calculation of airline emissions is similar to that of diesel operations. As with rail, fuel use by aircraft varies considerably with different types. To provide a fair evaluation, a new, fuel-efficient jet, the MD-80, was selected for comparison. This craft is touted as a member of the new age of aircraft and so provides an excellent comparison for the new age of rail, the HSR. Only the cruise mode of the aircraft was compared to HSR operations. This mode represents the great majority of the aircraft operation time. Taxi and takeoff vary considerably from airport to airport. Accordingly, comparing the cruise mode and associated emission per passenger-mile (or kilometer) of each alternative provides a better comparison basis.

The fuel use of the MD-80 is given as 1.926 lb/sec (0.87 kg/s) [Krull (FAA), personal communication, 1986]. With a capacity of 139–172 passengers and a 50% load factor, the MD-80 has an energy efficiency on the order of 0.162 lb/passenger-mile (0.046 kg/pass-km) for a speed of 550 mph (885 km/h). The FAA has determined air pollutant emission factors for this engine type (JT8D-209) at an 80% throttle setting (cruise) (Wayson and Bowby 1987). Table 1 shows the amount of fuel required and emitted pollutant amounts. These values, based on energy/passenger-mile (kilometer), provide good numbers for comparison. It should be noted that inore

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fuel is required per passenger-mile for aircraft than rail and, thus, emissions are greater.

**Air Pollution from HSR Systems**

The calculation of air pollutants for electric HSR operations is the same as for conventional rail operations, except the energy demands change. For instance, an energy consumption value of 864 BTU/passenger-mile (567 kJ/pass-km) is reported for the Japanese Shinkansen for a 50% load factor (JNR 1984). For the French TGV, the energy consumption is only 671 BTU/passenger-mile (440 kJ/pass-km) for the same load factor (Bergouignan, personal communication, 1986). The TVE MagLev train has an energy requirement ranging from 1,090 BTU/passenger-mile (715 kJ/pass-km) at 99 mph (160 km/h) up to 2,595 BTU/passenger-mile (1,702 kJ/pass-km) at 248 mph (400 km/h) (Gaymann et al., 1985). As before, roughly twice this energy requirement must be used at the electric power plant due to inefficiencies and line loss.

The pollutants released for these HSR systems are tabulated in Table 1. As shown, the air pollution emitted from HSR operations (for the same passenger-miles) is less than for aircraft, diesel rail, and existing North American electric operations. Accordingly, this is a benefit of HSR operations.

It should be noted that the comparison is made on a total pollutant load basis, as is commonly used in emission inventories or preliminary environmental documents. Health effects should be calculated based on concentration, which is a function of release rates and dispersion. Dispersion depends on the geometries of location, weather parameters, reactivity of release, and background concentrations. Accordingly, the analyst must use an appropriate dispersion model if more than a comparison of total pollutants emitted is required.

Another environmental hazard that must also be considered from HSR electric operation is electromagnetic radiation. Electromagnetic radiation and catenary arcing problems have been reported (Mitchell 1985) to: (1) Introduce noise in the signal and communications lines parallel to the railroad; (2) induce high voltage on electrical components near the wayside, which causes a potential hazard; (3) possibly cause certain health problems; (4) induce current flows in conductors that are in ground contact near the railroad causing erosion and potential hazards; and (5) cause radio frequency interference.

**CONCLUSIONS**

The data presented here provide guidance for a knowledgeable analyst to prepare an environmental document for a high-speed rail system. Also described are the environmental benefits that HSR has to offer over other conventional intercity mass-transportation systems, which include: (1) Less air pollution per passenger-mile than any other intercity mass transportation system except where coal is used and air pollution is emitted in similar amounts; (2) a single, well-controlled source instead of many uncontrolled sources; (3) a choice of fuels; (4) less noise at similar speeds than conventional rail; (5) no horn noises; and (6) available, effective noise control methods.

Some of these benefits can be significant, as with the French TGV system where nuclear power is the source and the transportation mode emits vir-

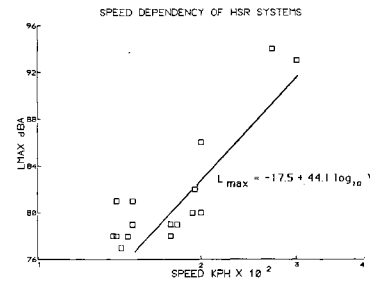


FIG. 6. Normalized HSR At-Grade Data; Distance = 30 m

tually no air pollutants. The use of noise abatement walls can reduce the relatively low noise levels by as much as 25 dBA. The "down-side" scenario is that power plants could cause higher concentrations at a given point. However, if properly sited, this problem is easily solved.

Of course to complete the environmental document procedure, predictive models must be available. In the case of air pollution, emission factors have been developed (USEPA 1983), and dispersion modeling of line and point sources are well documented. However, no good predictive tool has been developed for HSR noise. Least-mean square analysis has been used in the past to develop logarithmic equations relating maximum A-weighted noise levels for conventional systems with considerable success. This approach can also be used for HSR.

Fig. 6 shows data previously presented but normalized for a distance of 100 ft (30 m). All data presented are for at-grade unshielded conditions. For these HSR data, a good equation ( $r = 0.859$ ) can be developed:

$$L_A = -17.5 + 44.1 \log V, \quad \text{where } V \text{ is in km/h} \quad (6)$$

This equation, although based on a small data base, should provide a basis for preliminary environmental studies. Of course, where possible, calibration of the model would allow for a more accurate analysis. Also, this model predicts the maximum A-weighted noise level. For environmental documents, a time-averaged value would be required. This could be developed by knowing the number of trains and time required to pass a given point.

The ratio of initial speed to final speed also follows a logarithmic function. If  $V_i$  is known, a  $40 \log (V_f/V_i)$  relationship could allow an approximate prediction of the expected high-speed noise level increase.

Geometric spreading must also be considered. From data presented, it appears an HSR system should be modeled somewhere between a line source

# Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

(3 dBA per doubling of distance fall-off rate) and a point source (6 dBA per doubling of distance). A value of 4.5 dBA could be acceptable. Excess ground attenuation must also be considered for at-grade situations and grassy ground cover. Geometric spreading has more effect on overall noise levels than do changes in speed.

It should be noted that MagLev and other electric modes cannot be modeled with a simple logarithmic equation as used for other rail sources. More data are required before a predictive model can be developed.

New concerns that cannot be omitted from an environmental analysis are the electromagnetic radiation problems and noise from electric substations. However, with proper design and placement, these problems could be minimized.

This paper should assist in preparation of environmental documents on HSR systems. Air pollution factors presented here could be used directly in environmental documents. However, further research is required to supply the analyst with better predictive tools for noise.

## APPENDIX I. REFERENCES

- "Advanced prediction and abatement of highway traffic noise." (1982). *Lecture Notes and Training Course Manual*, U.S. Dept. of Transportation, Federal Highway Administration, Washington, D.C.
- Arai, M., and Yoshio, B. (1975). "Noise control for Shinkansen railways." *Inter-noise '75 Proc.*, Sendai, Japan.
- ASCE Subcommittee on High Speed Rail. (1985). "High-speed rail systems in the United States." *J. Transp. Engrg.*, ASCE, 111(2), 79-94.
- Barsikow, B., and Muller, B. (1985). "A detailed study of the vertical distribution of noise sources generated by a high-speed train." *Inter-Noise '85 Proc.*, Munich, FRG.
- Blennemann, F. (1985). "Results from noise and vibration research for urban railways." *Inter-Noise '85 Proc.*, Munich, FRG.
- "Compilation of Air Pollutant Emission Factors." (1983). *Report AP-42*, 14th Ed., U.S. Environmental Protection Agency, Office of Air Programs, Research Triangle Park, N.C.
- "Les Effets sur L'Environnement de la Ligne Nouvelle TGV Park/Sud-Est." (1983). SNCF, Cete de Lyon, France.
- Gaymann, T., Rahu, T., and Abraham, R. (1985). "Riding or flying?" *MVP Technical Brochure*, Munich, FRG.
- Goding, D. L. (1980). "Diesel-electric locomotive noise control." *Inter-Noise '80 Proc.*, Miami, Fla.
- Hanson, C. E. (1976). "Environmental noise assessment of railroad electrification." *Inter-Noise '76 Proc.*, Washington, D.C.
- Hanson, C. E. (1977). "Noise from high speed trains in the Northeast Corridor." *Noise-Con '77 Proc.*, Hampton, Va.
- Hidehiko, A., and Masaki, A. (1978). "Noise control of steel railway bridges in Shinkansen." *Inter-Noise '78 Proc.*, San Francisco, Calif.
- ICE technical data intercity experimental. (1987). MBB-Transportation Technology, Arlington, Va.
- Japan Environment Agency (JEA). (1985). "Further measures for achieving environmental quality standards for Shinkansen railway noise." *Japan Envir. Sum.*, 13(12).
- Keast, D. N. (1981). "Electrical substation design practice in the United States and its influence on transformer noise in surrounding communities." *Inter-Noise '81 Proc.*, Amsterdam, The Netherlands.
- Matsumura, H., and Shibata, T. (1975). "The characteristics of noise caused by the high-speed railways." *Inter-Noise '75 Proc.*, Sendai, Japan.

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- Mitchell, M. B. (1985). "High-speed passenger train safety." *Transportation Research Record 1023*, Transportation Research Board, Washington, D.C.
- Moriok, E. K. (1978). *Introduction to transportation engineering and planning*. McGraw-Hill, New York, N.Y.
- Nimura, T., et al. (1975). "Estimation of noise radiated from the Shinkansen railway." *Inter-Noise '75 Proc.*, Sendai, Japan.
- Nimura, T., Ebata, M., and Takahashi, T. (1976). "Estimation and consideration of the Shinkansen noise for a newly established line (New Tohoku Line)." *Inter-Noise '76 Proc.*, Washington, D.C.
- "Railroad classification yard technology: noise control." (1981). *FRA/ORD-31/18*, U.S. Dept. of Transportation, Federal Railroad Administration, Washington, D.C.
- Remington, P. J. (1976). "Wheel/rail noise, Part 1: Characterization of the wheel/rail dynamic system." *J. Sound Vib.*, 46(3).
- Shinkansen. (1984). Japanese National Railways (JNR), International Department, Tokyo, Japan.
- Smith, G. C., and Shirley, E. (1987). "High speed rail in California: The dream, the process, and the reality." Paper presented at the 66th Annual Transportation Research Board Meeting, Washington, D.C.
- Stusnick, E. (1984a). "Issues in transportation noise mitigation: highway and railway studies." *Transportation Research Record 983*, Transportation Research Board, Washington, D.C.
- Stusnick, E. (1984b). "Review of federal noise emission standards for interstate rail carriers." *Transportation Research Record 983*, Transportation Research Board, Washington, D.C.
- Vernet, M. (1984). "High-speed trains." International Seminar in Paris, France.
- Vuchic, V. R. (1981). *Urban public transportation systems and technology*. Prentice-Hall, Englewood Cliffs, N.J.
- Wayson, R. L. (1985). "The air pollution of railroad electrification in eastern Texas," thesis presented to the University of Texas at Austin, Tex., in partial fulfillment for the requirements for the degree of Master of Science.
- Wayson, R. L., and Bowley, W. (1987). "Inventorying airport air pollutant emissions." *J. Transp. Engrg.*, to be published, 1988.
- Wilson, G. P. (1977). "Rail transit system noise control." *Noise-Con '77 Proc.*, Hampton, Va.

## APPENDIX II. NOTATION

The following symbols are used in this paper:

- dBA = decibels on A-weighted scale (reference =  $2 \times 10^{-5}$  N/m<sup>2</sup>);
- $L_A$  = maximum A-weighted sound level;
- $r$  = correlation coefficient;
- $V$  = speed (mph);
- $V_f$  = final speed (km/h); and
- $V_o$  = initial speed (km/h).

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**WECC Standard BAL-STD-002-0 - Operating Reserves**

**A. Introduction**

- 1. Title:** Operating Reserves
- 2. Number:** BAL-STD-002-0
- 3. Purpose:** Regional Reliability Standard to address the Operating Reserve requirements of the Western Interconnection.
- 4. Applicability**
  - 4.1.1 This criterion applies to each Responsible Entity that is (i) a Balancing Authority or a member of a Reserve Sharing Group that does not designate its Reserve Sharing Group as its agent, or (ii) a Reserve Sharing Group. A Responsible Entity that is a Balancing Authority and a member of a Reserve Sharing Group is subject to this criterion only as described in Section A.4.1.2. A Responsible Entity that is a member of a Reserve Sharing Group is not subject to this criterion on an individual basis.
  - 4.1.2 Responsible Entities that are members of a Reserve Sharing Group may designate in writing to WECC a Responsible Entity to act as agent for purposes of this criterion for each such Reserve Sharing Group. Such Reserve Sharing Group agents shall be responsible for all data submission requirements under Section D of this Reliability Agreement. Unless a Reserve Sharing Group agent identifies individual Responsible Entities responsible for noncompliance at the time of data submission, sanctions for noncompliance shall be assessed against the agent on behalf of the Reserve Sharing Group, and it shall be the responsibility of the members of the Reserve Sharing Group to allocate responsibility for such noncompliance. If a Responsible Entity that is a member of a Reserve Sharing Group does not designate in writing to WECC a Responsible Entity to act as agent for purposes of this criterion for each such Reserve Sharing Group, such Responsible Entity shall be subject to this criterion on an individual basis.
- 5. Effective Date:** This Western Electricity Coordinating Council Regional Reliability Standard will be effective when approved by the Federal Energy Regulatory Commission under Section 215 of the Federal Power Act. This Regional Reliability Standard shall be in effect for one year from the date of Commission approval or until a North American Standard or a revised Western Electricity Coordinating Council Regional Reliability Standard goes into place, whichever occurs first. At no time shall this regional Standard be enforced in addition to a similar North American Standard.

**B. Requirements**

**WR1.**

The reliable operation of the interconnected power system requires that adequate generating capacity be available at all times to maintain scheduled frequency and avoid loss of firm load following transmission or generation contingencies. This generating capacity is necessary to:

- supply requirements for load variations.
- replace generating capacity and energy lost due to forced outages of generation or transmission equipment.
- meet on-demand obligations.

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**WECC Standard BAL-STD-002-0 - Operating Reserves**

- replace energy lost due to curtailment of interruptible imports.
- a. Minimum Operating Reserve. Each Balancing Authority shall maintain minimum Operating Reserve which is the sum of the following:
    - (i) Regulating reserve. Sufficient Spinning Reserve, immediately responsive to Automatic Generation Control (AGC) to provide sufficient regulating margin to allow the Balancing Authority to meet NERC's Control Performance Criteria (see BAL-001-0).
    - (ii) Contingency reserve. An amount of Spinning Reserve and Nonspinning Reserve (at least half of which must be Spinning Reserve), sufficient to meet the NERC Disturbance Control Standard BAL-002-0, equal to the greater of:
      - (a) The loss of generating capacity due to forced outages of generation or transmission equipment that would result from the most severe single contingency; or
      - (b) The sum of five percent of the load responsibility served by hydro generation and seven percent of the load responsibility served by thermal generation.

The combined unit ramp rate of each Balancing Authority's on-line, unloaded generating capacity must be capable of responding to the Spinning Reserve requirement of that Balancing Authority within ten minutes

Additional reserve for interruptible imports. An amount of reserve, which can be made effective within ten minutes, equal to interruptible imports.

  - (iv) Additional reserve for on-demand obligations. An amount of reserve, which can be made effective within ten minutes, equal to on-demand obligations to other entities or Balancing Authorities.
- b. Acceptable types of Nonspinning Reserve. The Nonspinning Reserve obligations identified in subsections a(ii), a(iii), and a(iv), if any, can be met by use of the following:
  - (i) interruptible load;
  - (ii) interruptible exports;
  - (iii) on-demand rights from other entities or Balancing Authorities;
  - (iv) Spinning Reserve in excess of requirements in subsections a(i) and a(ii); or
  - (v) off-line generation which qualifies as Nonspinning Reserve.
- c. Knowledge of Operating Reserve. Operating Reserves shall be calculated such that the amount available which can be fully activated in the next ten minutes will be known at all times.

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**WECC Standard BAL-STD-002-0 - Operating Reserves**

- d. Restoration of Operating Reserve. After the occurrence of any event necessitating the use of Operating Reserve, that reserve shall be restored as promptly as practicable. The time taken to restore reserves shall not exceed 60 minutes (Source: WECC Criterion)

**C. Measures**

**WML**

Except within the first 60 minutes following an event requiring the activation of Operating Reserves, a Responsible Entity identified in Section A.4 must maintain 100% of required Operating Reserve levels based upon data averaged over each clock hour. Following every event requiring the activation of Operating Reserves, a Responsible Entity identified in Section A.4 must re-establish the required Operating Reserve levels within 60 minutes. (Source: Compliance Standard)

**D. Compliance**

**1. Compliance Monitoring Process**

**1.1 Compliance Monitoring Responsibility**

Western Electricity Coordinating Council (WECC)

**1.2 Compliance Monitoring Period**

At Occurrence and Quarterly

By no later than 5:00 p.m. Mountain Time on the first Business Day following the day on which an instance of non-compliance occurs (or such other date specified in Form A.1(a)), the Responsible Entities identified in Section A.4 shall submit to the WECC office Operating Reserve data in Form A.1(a) (available on the WECC web site) for each such instance of non-compliance. On or before the tenth day of each calendar quarter (or such other date specified in Form A.1(b)), the Responsible Entities identified in Section A.4 (including Responsible Entities with no reported instances of non-compliance) shall submit to the WECC office a completed Operating Reserve summary compliance Form A.1(b) (available on the WECC web site) for the immediately preceding calendar quarter.

**1.3 Data Retention**

Data will be retained in electronic form for at least one year. The retention period will be evaluated before expiration of one year to determine if a longer retention period is necessary. If the data is being reviewed to address a question of compliance, the data will be saved beyond the normal retention period until the question is formally resolved. (Source: NERC Language)

**1.4 Additional Compliance Information**

For purposes of applying the sanctions specified in [Sanction Table](#) for violations of this criterion, the "Sanction Measure" is Average Generation and the "Specified Period" is the most recent calendar month. (Source: Sanctions)

**2. Levels of Non-Compliance Sanction**

Measure: Average Generation

**WECC Standard BAL-STD-002-0 - Operating Reserves**

- 2.1. Level 1: There shall be a Level 1 non-compliance if any of the following conditions exist:

2.1.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 100% but greater than or equal to 90% of the required Operating Reserve.

- 2.2. Level 2: There shall be a Level 2 non-compliance if any of the following conditions exist:

2.2.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 90% but greater than or equal to 80% of the required Operating Reserve.

- 2.3. Level 3: There shall be a Level 3 non-compliance if any of the following conditions exist:

2.3.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 80% but greater than or equal to 70% of the required Operating Reserve.

- 2.4. Level 4: There shall be a Level 4 non-compliance if any of the following conditions exist:

2.4.1 One instance during a calendar month in which the Balancing Authority's or the Reserve Sharing Group's Operating Reserve is less than 70% of the required Operating Reserve.

**E. Regional Differences**

**Version History** – Shows Approval History and Summary of Changes in the Action Field

Version	Date	Action	Change Tracking
0	March 12, 2007	Adopted by Board of Trustees	New
0	June 8, 2007	FERC order issued approving BAL-STD-002-0	

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### WECC Standard BAL-STD-002-0 - Operating Reserves

#### Sanction Table

Sanctions for non-compliance with respect to each criterion in Section B Requirements shall be assessed pursuant to the following table. All monetary sanctions shall also include sending of Letter (B).

Level of Non-	Number of Occurrences at a Given Level within Specified Period			
	1	2	3	4 or more
Level 1	Letter (A)	Letter (B)	Higher of \$1,000 or \$1 per MW of Sanction Measure	Higher of \$2,000 or \$2 per MW of Sanction Measure
Level 2	Letter (B)	Higher of \$1,000 or \$1 per MW of Sanction Measure	Higher of \$2,000 or \$2 per MW of Sanction Measure	Higher of \$4,000 or \$4 per MW of Sanction Measure
Level 3	Higher of \$1,000 or \$1 per MW of Sanction Measure	Higher of \$2,000 or \$2 per MW of Sanction Measure	Higher of \$4,000 or \$4 per MW of Sanction Measure	Higher of \$6,000 or \$6 per MW of Sanction Measure
Level 4	Higher of \$2,000 or \$2 per MW of Sanction Measure	Higher of \$4,000 or \$4 per MW of Sanction Measure	Higher of \$6,000 or \$6 per MW of Sanction Measure	Higher of \$10,000 or \$10 per MW of Sanction Measure

Letter (A): Letter to Responsible Entity's Chief Executive Officer informing the Responsible Entity of noncompliance with copies to NERC, WECC Member Representative, and WECC Operating Committee Representative 1.

Letter (B): Identical to Letter (A), with additional copies to (i) Chairman of the Board of Responsible Entity (if different from Chief Executive Officer), and to (ii) state or provincial regulatory agencies with jurisdiction over Responsible Entity, and, in the case of U.S. entities, FERC, and Department of Energy, if such government entities request such information.

The "Specified Period" and the "Sanction Measure" are as specified in Section D1.4 for each criterion.

Sanctions shall be assessed for all instances of non-compliance within a Specified Period. For example, if a Responsible Entity had two instances of Level 1 non-compliance and

<sup>1</sup> Copies of Letter A and Letter B will be sent to WECC Member Representative and WECC Operating Committee Representative when the Generator Operator is a WECC member.

### WECC Standard BAL-STD-002-0 - Operating Reserves

one instance of Level 3 non-compliance for a specific criterion in the first Specified Period, it would be assessed the sanction from Column 2 of the Level 1 row, and the sanction from Column 1 of the Level 3 row.

If the Responsible Entity fails to comply with a given criterion for two or more consecutive Specified Periods, the sanctions assessed at each level of noncompliance for the most recent Specified Period shall be the sanction specified in the column immediately to the right of the indicated sanction. For example, if a Responsible Entity fails to comply with a given criterion for two consecutive Specified Periods, and in the second Specified Period the Responsible Entity has one instance of Level 1 non-compliance and two instances of Level 3 non-compliance, it would be assessed the sanction from Column 2 of the Level 1 row, and the sanction from Column 3 of the Level 3 row. If the sanction assessed at the highest level is the sanction in Column 4, no such modification of the specified sanction shall occur.

#### DEFINITIONS

Unless the context requires otherwise, all capitalized terms shall have the meanings assigned in this Standard and as set out below:

Area **Control** Error or ACE means the instantaneous difference between net actual and scheduled interchange, taking into account the effects of Frequency Bias including correction for meter error.

**Automatic Generation Control** or AGC means equipment that automatically adjusts a Control Area's generation from a central location to maintain its interchange schedule plus Frequency Bias.

**Average Generation** means the total MWh generated within the Balancing Authority Operator's Balancing Authority Area during the prior year divided by 8760 hours (8784 hours if the prior year had 366 days).

**Business Day** means any day other than Saturday, Sunday, or a legal public holiday as designated in section 6103 of title 5, U.S. Code.

**Disturbance** means (i) any perturbation to the electric system, or (ii) the unexpected change in ACE that is caused by the sudden loss of generation or interruption of load.

**Extraordinary Contingency** shall have the meaning set out in Excuse of Performance, section B.4.c.

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### WECC Standard BAL-STD-002-0 - Operating Reserves

**Frequency Bias** means a value, usually given in megawatts per 0.1 Hertz, associated with a Control Area that relates the difference between scheduled and actual frequency to the amount of generation required to correct the difference.

**Nonspinning Reserve** means that Operating Reserve not connected to the system but capable of serving demand within a specified time, or interruptible load that can be removed from the system in a specified time.

**Operating Reserve** means that capability above firm system demand required to provide for regulation, load-forecasting error, equipment forced and scheduled outages and local area protection. Operating Reserve consists of Spinning Reserve and Nonspinning Reserve.

**Spinning Reserve** means unloaded generation which is synchronized and ready to serve additional demand. It consists of Regulating reserve and Contingency reserve (as each are described in Sections B.a.i and ii).

### EXCUSE OF PERFORMANCE

#### A. Excused Non-Compliance

Non-compliance with any of the reliability criteria contained in this Standard shall be excused and no sanction applied if such non-compliance results directly from one or more of the actions or events listed below.

#### B. Specific Excuses

##### 1. Governmental Order

The Reliability Entity's compliance with or action under any applicable law or regulation or other legal obligation related thereto or any curtailment, order, regulation or restriction imposed by any governmental authority (other than the Reliability Entity, if the Reliability Entity is a municipal corporation or a federal, state, or provincial governmental entity or subdivision thereof).

##### 2. Order of Reliability Coordinator

The Reliability Entity's compliance or reasonable effort to comply with any instruction, directive, order or suggested action ("Security Order") by the WECC Reliability Coordinator for the WECC sub-region within which the Reliability Entity is operating, provided that the need for such Security Order was not due to the Reliability Entity's non-compliance with (a) the WECC Reliability Criteria for Transmission System Planning, (b) the WECC Power Supply

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### WECC Standard BAL-STD-002-0 - Operating Reserves

Design Criteria, (c) the WECC Minimum Operating Reliability Criteria, or (d) any other WECC reliability criterion, policy or procedure then in effect (collectively, "WECC Reliability Standards"), and provided further that the Reliability Entity in complying or attempting to comply with such Security Order has taken all reasonable measures to minimize Reliability Entity's non-compliance with the reliability criteria.

#### 3. Protection of Facilities

Any action taken or not taken by the Reliability Entity which, in the reasonable judgment of the Reliability Entity, was necessary to protect the operation, performance, integrity, reliability or stability of the Reliability Entity's computer system, electric system (including transmission and generating facilities), or any electric system with which the Reliability Entity's electric system is interconnected, whether such action occurs automatically or manually; provided that the need for such action or inaction was not due to Reliability Entity's non-compliance with any WECC Reliability Standard and provided further that Reliability Entity could not have avoided the need for such action or inaction through reasonable efforts taken in a timely manner. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Reliability Entity demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable.

#### 4. Extraordinary Contingency

a. Any Extraordinary Contingency (as defined in subsection c); provided that this provision shall apply only to the extent and for the duration that the Extraordinary Contingency actually and reasonably prevented the Reliability Entity from complying with any applicable reliability criteria; and provided further that Reliability Entity took all reasonable efforts in a timely manner to mitigate the effects of the Extraordinary Contingency and to resume full compliance with all applicable reliability criteria contained in this Reliability Agreement. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Reliability Entity

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**WECC Standard BAL-STD-002-0 - Operating Reserves**

demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable. Reasonable efforts shall not include the settlement of any strike, lockout or labor dispute.

- b. Any Reliability Entity whose compliance is prevented by an Extraordinary Contingency shall immediately notify the WECC of such contingency and shall report daily or at such other interval prescribed by the WECC the efforts being undertaken to mitigate the effects of such contingency and to bring the Reliability Entity back into full compliance.
- c. An Extraordinary Contingency means any act of God, actions by a non-affiliated third party, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, earthquake, explosion, accident to or breakage, failure or malfunction of machinery or equipment, or any other cause beyond the Reliability Entity's reasonable control; provided that prudent industry standards (ms., maintenance, design, operation) have been employed; and provided further that no act or cause shall be considered an Extraordinary Contingency if such act or cause results in any contingency contemplated in any WECC Reliability Standard (e.g., the "Most Severe Single Contingency" as defined in the WECC Reliability Criteria or any lesser contingency).

**5. Participation in Field Testing**

Any action taken or not taken by the Reliability Entity in conjunction with the Reliability Entity's involvement in the field testing (as approved by either the WECC Operating Committee or the WECC Planning Coordination Committee) of a new reliability criterion or a revision to an existing reliability criterion where such action or non-action causes the Reliability Entity's non-compliance with the reliability criterion to be replaced or revised by the criterion being field tested; provided that Reliability Entity's noncompliance is the result of Reliability Entity's reasonable efforts to participate in the field testing.

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**RESEARCH EVALUATION OF  
WIND GENERATION,  
SOLAR GENERATION, AND STORAGE  
IMPACT ON THE CALIFORNIA GRID**

Prepared For:  
**California Energy Commission**  
Public Interest Energy Research Program

Prepared By:  
KEMA, Inc.



PIER FINAL PROJECT REPORT

June 2010  
CEC-500-2010-010

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**Preface**

The California Energy Commission's Public Interest Energy Research (PIER) Program supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

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- Energy Innovations Small Grants
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- Energy Systems Integration
- Environmentally Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Transportation

*Research Evaluation of Wind and Solar Generation, Storage Impact, and Demand Response on the California Grid* is the final report for the *Facilitation of the Results Gained from the Research Evaluation of Wind Generation, Storage Impact, and Demand Response on the CA Grid* project (Contract Number 500-06-014, Work Authorization Number KEMA-06-024-P-S) conducted by KEMA, Inc. The information from this project contributes to PIER's Renewable Energy Technologies Program.

For more information about the PIER Program, please visit the Energy Commission's website at [www.energy.ca.gov/research/](http://www.energy.ca.gov/research/) or contact the Energy Commission at 916-654-4878.

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### Abstract

This report analyzes the effect of increasing renewable energy generation on California’s electricity system and assesses and quantifies the system’s ability to keep generation and energy consumption (load) in balance under different renewable generation scenarios. In particular, researchers assessed four key elements necessary for integrating large amounts of renewable generation on California’s power system. Researchers concluded that accommodating 33 percent renewables generation by 2020 will require major alterations to system operations. They also noted that California may need between 3,000 to 5,000 or more megawatts (MW) of conventional (fossil-fuel-powered or hydroelectric) generation to meet load and planning reserve margin requirements.

The study examines the relative benefit of deploying electricity storage versus utilizing conventional generation to regulate and balance load requirements. To reach storage’s full potential, researchers developed new control schemes to take advantage of higher response speeds of fast storage, examined storage performance requirements, and noted maximum useful amounts to meet both regulation and balancing requirements. Researchers also noted the effectiveness of storage technologies, in comparison to conventional generation, to meet energy systems’ need to accommodate large output changes of energy resources in a relatively short period.

The report provides policy and research options to ensure optimum use of electricity storage with the associated increase in renewable generation connected to the system.

**Keywords:** Renewable energy, solar, wind, energy storage, integration, AGC, ACE, ancillary services, frequency regulation, balancing, ramping, RPS, grid, independent system operator

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## Executive Summary

### Introduction

The integration of renewable energy resources into the electricity grid has been intensively studied for its effects on energy costs, energy markets, and grid stability. These studies all conclude that the variability and high-ramping characteristics of renewable generation create operational issues. However, there have been few efforts to precisely quantify these effects with a highly dynamic model that simulates system performance on a time scale of one second or less, compared to a one-hour basis that is typical in production cost simulations. This study constitutes such an effort.

### Project Purpose

This research identifies key issues and assesses the effects of high renewable penetrations on intra-hour system operations of the California Independent System Operator (California ISO) control area. It also looks at how grid-connected electricity storage might be used to accommodate the effects of renewables on the system. To do this, researchers used high-fidelity modeling to analyze the effects of planned additions of renewable generation on electric system performance. The research focuses on required changes to current systems to balance generation and load second-by-second and minute-by-minute, and to do so in the most cost-effective manner.<sup>1</sup> The study also assessed potential benefits of deploying grid-connected electricity storage to provide some of the required components—including regulation, spinning reserves,<sup>2</sup> automatic governor control response<sup>3</sup>, and balancing energy—necessary for integrating large amounts renewable generation.

### Project Objectives

The objective was to measure the effects of the variability associated with large amounts of renewable resources (20 percent and 33 percent renewable energy) on system operation and to ascertain how energy storage and changes in energy dispatch strategies could accommodate those effects and improve grid performance. This project used a new modeling tool—KEMA's proprietary KERMIT model, which employs a dynamic model of the power system and

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<sup>1</sup> Automatic generation control operates the generators that supply regulation services (up and down) every 4 seconds to keep system frequency and net interchange error as scheduled. The *real-time dispatch* buys and sells energy from generators participating in the real-time or balancing market every five minutes to adjust generator schedules to track a system's load changes.

<sup>2</sup> Regulation in MW is the amount of second-by-second *bandwidth* or controllability used in balancing generation and load. Spinning reserve is the excess amount of on-line generation capacity over the amount required to supply load and available to respond to sudden load changes or loss of a generator.

<sup>3</sup> Governor response is the near-instantaneous adjustment of each generator's output in response to system frequency changes, caused by the generator speed-governing device.

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generators—to assess the electricity system’s performance in one-second to one-day time frames using techniques that captured the full range of system dynamic effects.

Specific objectives of the research were as follows:

1. Calibrate the dynamic model—using existing electricity-generation-fleet capacities, actual daily schedules, loads, interchange, area control error,<sup>4</sup> and frequency data provided by the California ISO on four-second and one-minute bases as described below—and extend that model to 2012 and 2020 time frames with 20 percent and 33 percent renewables portfolio standard levels. Assume planned changes to the generation fleet (retirements, upgrades) and renewable capacities per current California Public Utilities Commission-developed forecasted portfolios and state forecasts for load growth.
2. Assess droop, ancillary services, and balancing needs<sup>5</sup> with current system controls.
3. Assess the effect of increased storage and regulation and balancing on system performance.
4. Examine automatic generation control<sup>6</sup> algorithms for storage.
5. Determine the relative benefits of different amounts of storage.
6. Determine storage characteristic requirements.
7. Determine the storage-equivalent of a 100-megawatt (MW) gas turbine.
8. Identify issues with incorporating large-scale storage in California.

### Outcomes

Project outcomes, in the order of project objectives, are as follows:

1. The model was successfully calibrated to match historical data.
2. System performance degraded, in terms of maximum area control error excursions and North American Electric Reliability Corporation control performance standards, significantly for 20 percent renewables penetration and became extreme at 33 percent

<sup>4</sup> Area control error is the deviation from scheduled interchange power flows (in MW) plus the system bias (a constant) times the deviation in system frequency, as defined by the North American Electric Reliability Coordinator.

<sup>5</sup> Droop is the gain on the generator’s local speed-governing device, that is, how sensitive the generator’s output is to changes in system frequency. Ancillary services are those services that generators sell to the California ISO to enable system reliability and to follow load. Balancing energy is the energy the California ISO buys and sells every five minutes via real-time dispatch to follow load.

<sup>6</sup> Automatic generation control is the computer system at the California ISO that controls the generators in real time to balance load and generation second-by-second

renewables penetration, using the same automatic generation control strategies and amounts of regulation services as today. Without adjustment to the automatic generation control and the amount of regulation procured maximum area control error excursions went from a typical band today of the order of  $\pm 100$  MW to several times that in the 20 percent renewables scenario and to as much as 3,000 MW of error in the 33 percent scenarios. Such an excursion is not tolerable and would possibly cause other system protective devices to operate such as interrupting transmission flows to adjacent power systems.

3. The amount of regulation, without storage and using existing control algorithms, required to maintain system performance within acceptable limits for a 20 percent renewable case in 2012 was  $\pm 800$  MW in the up and down direction, roughly double today’s amount.<sup>7</sup>
4. The amount of regulation and imbalance energy dispatched in real time, without storage and using existing control systems to maintain system performance, within acceptable limits during morning and evening ramp hours for 33 percent renewable cases in 2020 was 4,800 MW. The amount of regulation and imbalance energy dispatched in real time, without storage and using existing control algorithms, to maintain system performance within acceptable limits during non-ramp hours to address system volatility for the 33 percent renewable cases in 2020 was approximately an additional 600 MW. By comparison, 1,200 MW of storage added to the baseline 400 MW of regulation provided superior results by comparison. (See Table 1).
5. Generally, the largest deviations in system performance occurred twice per day, once during the morning and once during the evening, corresponding to the interaction of diurnal production of wind and solar resources and fluctuation of demand. Accordingly, degradation of system performance appears to be predominantly caused by renewable ramping in the morning and evening along with traditional morning and evening load ramps.
6. Increasing regulation amounts, without the use of storage and improved control algorithms, can improve system performance. However, roughly 2-to-10 times the amount of today’s regulation and balancing capacity would be required to maintain system performance absent other operating protocols, such as limiting ramp rates and new services that could be developed as alternatives to address renewable ramping as well as scheduling and forecasting errors.
7. Adjustments to the droop settings of generators from the current 5-10 percent had little effect on system performance.
8. Design changes to the automatic generation control mathematics and calculations allowed the automatic generation control to make better use of the higher response

<sup>7</sup> Regulation in MW is the amount of second-by-second *bandwidth* or controllability, California ISO-procured from participating generators, used in balancing generation and load.

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speed of the storage devices and resulted in better system performance with less overall regulation procured.

9. Large-scale storage can improve system performance by providing regulation and imbalance energy for ramping or load following capability. The 3,000 to 4,000 MW range of fast-acting storage with a two-hour duration achieved solid system performance across all renewable penetration scenarios examined. (The range 3,000-4,000 MW reflects the different days studied and the levels of incremental storage simulated, for example, 3,200 MW, 3,600 MW, and so on.)
10. Existing battery technologies appear to have the capabilities required to manage renewable integration, including two-hour durations and ramping capabilities of 10 MW/second or greater.
11. On an incremental basis, storage can be up to two to three times as effective as adding a combustion turbine to the system for regulation purposes. The relative effect of each depends on how much storage or regulation and balancing is already in the system. For example, when the system has sufficient resources for stabilizing system performance, the incremental benefit of either technology approaches zero. This is an incremental ratio of the effect a combustion turbine or a storage device each have on system performance, and not an indicator of how much total capacity of each technology may be needed to manage the large ramping phenomena.
12. Without the use of storage, ramping of combustion turbine generators and hydro-electric generation is likely to increase. This may likely have detrimental effects on equipment maintenance costs and life of the equipment, and greenhouse gas emissions because the resources will be asked to generate more often at less than optimal production ranges as well as to remain *committed*—that is, on-line—in anticipation of ramping needs.

**Conclusions**

Governors' executive order S-14-08 established a goal of 33 percent energy from renewable resources to serve California customer load by 2020. This will require significant increases in ancillary services (regulation) and real-time dispatch energy, with attendant changes in the day ahead schedules of generation production by hour to ensure that such services are available—that is, that enough generators will be on-line with excess capacity available during each hour. Such a change in scheduling practice will incur additional economic costs in the production of power. The use of storage in conjunction with new control and generation ramping strategies offers innovative solutions that are consistent with the need to continue to comply with current North American Electric Reliability Corporation system performance standards. Electricity storage promises to be a useful tool to provide environmentally benign additional ancillary service and ramping capability to make renewable integration easier. However, while this report concludes that the system flexibility provided by storage is more efficient than equivalent conventional generation capacity, it has not performed a comparative cost-benefit analysis either in terms of fixed capital or variable costs.

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Based on the outcomes observed, researchers made the following conclusions:

1. The California ISO control area as simulated would require between 3,000 and 5,000 MW of regulation and energy for balancing and ramping services from *fast* resources (hydroelectric generators and combustion turbines) for the scenario of 33 percent renewable penetration scenario in 2020, absent other measures to address renewable ramping characteristics (See Table 1). The range reflects the different seasonal patterns in the days studied, as well as the mix of fast storage (capable of 10 MW/second ramping) versus fast new and upgraded conventional units (combustion turbine and hydro expected as of 2020). The large ramping requirement is driven by the combination of solar generation and wind generation variability that is forecasted for the 33 percent scenario. Included within this variability is the steep, yet highly predictable, production curve associated with solar resources as the sun comes up in the morning and sets in the evening. Some of this ramping requirement can be satisfied by altering the likely system commitment for conventional generation to maintain a large amount of gas-fired combustion turbines on-line for ramping. It also may be possible to alter the scheduling of hydroelectric facilities and pump-storage facilities so as to assure adequate ramping potential at critical periods, although there are environmental and operational difficulties associated with this potential solution. Finally, altering or controlling the ramp rate of wind and solar resources for known ramping events such as sunrise and sunset can reduce regulation, balancing, and ramping requirements, but at the cost of *curtailing* renewable output. Because the study simulated only four days (to represent the seasonality) and did not focus on scheduling protocols, these results with respect to the ramping problem should be taken as indicative of the order of magnitude of the problem and not a quantitative basis for planning. As recommended below, additional study will be required to determine the amount of operational reserves required in 2020.
2. The moment-by-moment volatility of renewable resources may need up to twice the amount of automatic generation control or regulation compared to today's levels in the 20 percent scenario and somewhat more in the 33 percent. This is consistent with prior studies and manageable based on simulations using existing and anticipated sources of supply.
3. Generation ramping requirements to meet the morning load increase and the evening load decrease, as well as potentially other large changes in net load during the day, require large changes to generation dispatch in very short periods and may be the major operational challenge to ensuring reliability under a 33 percent renewable scenario. Under the 33 percent renewable scenario, these ramps will be difficult to manage in the current paradigm of regulation and balancing energy/real-time dispatch, where automatic generation control and real-time energy dispatch must be used to counteract large renewable ramping behavior and scheduling / forecast errors. There should be an investigation into new protocols for renewable ramping and provide incentives for incentivizing the needed flexibility to reduce its effects would appear to be in order. Also, as the study used an algorithm for real-time dispatch more reflective of the older

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balancing energy system than the new MRTU algorithm<sup>8</sup>, these figures should be taken as indicative rather than absolute as the extent to which MRTU will manage these effects was not investigated. However, errors in renewable forecasting and scheduling will still provide major challenges.

4. Fast storage (capable of at least 5 MW/second if not up to 10 MW/second in aggregate) is more effective than generally slower conventional generation in meeting the need for regulation and ramping capability and storage carries no additional emissions costs and limited cost penalties in terms of sub-optimal dispatch costs. The full benefit of fast storage for system ramping and regulation and balancing is achieved only via the use of automatic generation control algorithms developed specifically for the integration of storage resources. One such control algorithm was developed during the course of this study and is described in the report in detail.
5. Use of storage avoids greenhouse gas emissions increases associated with committing combustion turbines strictly for regulation, balancing, and ramping duty.
6. A 30-to-50 MW storage device is as effective or more effective as a 100 MW combustion turbine used for regulation purposes, given the use of the storage-specific control algorithms as mentioned in (4) above, the faster response of the storage as compared to a gas turbine, and the fact that a 50 MW storage device has an approximate - 50 to + 50 MW operating range that is equivalent to a zero to 100 MW range for a combustion turbine for regulation purposes.

Table 1 summarizes the quantitative benefits of using storage to address minute-to-minute volatility by noting its impact on system performance from 10 a.m. to 4 p.m. Major renewable resource and load ramping behavior occurs outside of this time frame and therefore does not include the periods that triggered the highest levels of balancing energy in real time. The table illustrates three metrics to gauge system performance—area control error, frequency deviation, control performance standard 1<sup>9</sup>—and notes relative amounts of regulation required to achieve similar performance between conventional resources and storage. Typical control performance standard 1 values are in the range of 180 to 190 percent, with an acceptable minimum of 100. Therefore, to avoid degradation of service reliability, that target system performance was similarly used in this study. Thus, larger figures of merit for control performance standard as

<sup>8</sup> During 2004 – 2009 the California ISO replaced the original real-time dispatch software with a new version, called *MRTU*, which employed more sophisticated mathematics and modeling to better and more economically adjust generation every five minutes.

<sup>9</sup> Area control error and frequency deviation were defined above. Control performance standard is a calculation of the system performance in terms of maximum area control error which is specified by the National Electric Reliability Coordinator so as to guarantee that all the interconnected power systems balance their load and generation *well enough* to maintain system reliability.

well as frequency deviations reflect worse system performance. In general, Table 1 demonstrates that storage can achieve better performance in the system per MW installed than regulation from conventional generation. (In this table, as in many other tables and figures in the report, the text *regulation* is a proxy for the net amount capacity capable of fast ramping to follow system changes via regulation and balancing energy.) Today, the California ISO has separate *reg up* and *reg down* products<sup>10</sup> and is able to procure different amounts of each. This simulation assumed symmetric *reg up* and *reg down* allocations throughout so that potential incremental savings associated with reduced procurement in one direction are not captured.

**Table 1. System performance with storage and increased regulation during non-ramping hours (10 AM to 4 PM) (data provided by the authors during the conduct of the project)**

Scenario	Added Amount (MW)		Worst Maximum Area Control Error (MW)		Worst Frequency Deviation (Hz)		Worst Control Performance Standard 1 (percent)	
	Regulation	Storage	Regulation	Storage	Regulation	Storage	Regulation	Storage
2010 RPS*	400	200	477	311	0.0470	0.0438	184	195
2020 RPS* Low <sup>11</sup>	800	400	480	493	0.0610	0.0609	190	190
Estimate								
2020 RPS* High <sup>11</sup>	1,600	1,200	480	344	0.0610	0.0590	191	196
Estimate								

\*RPS: Renewables Portfolio Standard

Overall, study conclusions on the regulation necessary to address the moment-to-moment variability appear to compare well to other similar studies, including a 2007 study by the California ISO entitled *Integration of Renewable Resources*. For example, this analysis recommends at least 400 MW or more additional regulation (but not balancing energy) for the 20 percent Renewables Portfolio Standard scenario while the California ISO report recommends 250 to 500 MW more depending on the season. The California ISO study did not focus on the 33 percent Renewables Portfolio Standard scenario.

#### Recommendations

The research study considers only a handful of days throughout the year. Additional research using a larger data sample is essential to better gauge the likelihood of impacts over a year and

<sup>10</sup> The California ISO procures regulation in an asymmetric fashion – it can procure the ability to move generators up at a different amount than it does down.

<sup>11</sup> See Table 3 on page 27 for High-Low Generation Capacity by Type. These are projections for the amount of renewable resources that will be online in 2020 to meet the RPS. A low estimate and a high estimate are detailed in Table 3.

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to ensure the full range of potential issues have been identified. In addition, the development of improved concentrated solar modeling would facilitate quantification of the effects of geographic and technological diversity and thereby help identify the extent to which ramping of this resource could be managed. That is, if the concentrated solar thermal plants are in different geographic locations they might ramp up and down during the day at different times, especially if cloud cover as opposed to sunrise/sunset is the driving factor. Different technological designs of the plants may lead to faster or slower ramping, and even to the ability to control ramping to some extent. Finally, better information about the extent to which out-of-state renewable imports will be shaped and firmed by balancing authorities will help to better gauge California ISO-specific needs.

### Research Recommendations

- **Add additional days to the sample.** Obtain results that reflect a larger sample of days to understand the statistical behavior and extremes in renewable volatility and ramping.
- **Develop dynamic concentrated solar generation model.** Ramping was identified as a significant issue related to concentrated solar generation resources. Develop a model to more thoroughly understand concentrated solar generation, particularly with respect to developing a better understanding of the dynamic performance of such resources and how to manage ramping issues. Given that wide-scale solar technology is in its infancy and can be expected to develop rapidly, improving modeling capability will require collaboration with resource developers.
- **Examine geographic and temporal diversity of renewables.** Understand the statistical behavior and extremes in renewable resource volatility and ramping. That is, how variable are renewable resource's production during the day in response to weather conditions (wind speed, cloud cover, and so on).
- **Carefully investigate the interaction of renewable energy forecasting and scheduling with generation scheduling to understand the potential ramping requirements of conventional generation / electricity storage imposed especially by forecast errors.** The hourly scheduling protocol that establishes a fixed schedule for the entire hour a full hour prior to the operating hour seems to be a source of much of the ramping difficulty. Errors in the timing of forecasted renewable ramps of as little as 15 minutes can have large effects. Attacking this problem with large amounts of regulation and balancing or electricity storage may not be as productive as other alternatives including renewable resource ramp rate limitations<sup>12</sup>, sub-hourly scheduling protocols<sup>13</sup>, investments in

<sup>12</sup> Operational limits imposed by the California ISO on renewable resources that specify the maximum rate of change of their net production.

<sup>13</sup> Forecasting and scheduling renewable production on a 15- or 30-minute basis instead of hourly as is done today.

short-term renewable production forecasting, or other changes in market service and interconnection protocols.

- **Validate ancillary service protocols for electricity storage.** Future research and development is needed on advanced control strategies linked to wind and solar power forecasting. This will affect the research, development, and engineering directions taken by the energy storage industry.
- **Conduct a cost analysis for solution alternatives.** This report looked at the technical potential of electricity storage only. Cost considerations will weigh into how to balance different options, including promoting incentives for existing conventional generation to provide added flexibility, the relative value of different flexible resources, and other ramp mitigation measures.
- **Examine the use of demand response as an additional ancillary service to facilitate renewable integration and potentially the use of electricity storage.** It is not yet apparent that demand response programs can meet all ISO requirements to provide the high-speed response required to manage renewable ramping. If it turns out that the benefits of rapidly responding demand response are feasible and consistent with system needs, that knowledge will be important in the design of smart grid capabilities for demand response and the associated protocols.
- **Continue development of automatic generation control algorithms for control of multiple electricity storage resources and conventional generation at high renewables levels.** Investigate the value of adding a 5-minute or 10-minute *look-ahead* feature in the automatic generation control algorithm that would predict the short-term changes in load and renewable generation resources.
- **The problems that may occur off-peak** due to wind volatility were implicitly covered in the study in that the selected days were studied for the full 24 hours. The results for intra-hour volatility and automatic generation control requirements are implicit in the results. However, the behavior of the system for major wind ramping phenomena off peak were not studied, and the days selected may not indicate the potential magnitude of the problem. Additional studies that look at the off peak hours in particular may be in order.

### Policy Recommendations

There are two major policy options that should be considered a result of this study, and several secondary issues are raised.

First, the possible resolution of how to manage the operational challenges of renewables will have five elements that will need to be addressed:

- Use fast storage for regulation, balancing, and ramping either as a system resource to address aggregate system variability or as a resource used by renewable resource operators to address individual resource variability and ramping characteristics.

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- Procurement of increased regulation, balancing, and reserves by the California ISO.
- Possible imposition of requirements on renewable resources to accommodate their effects on grid operation, such as ramp rate limits on renewable resources, more accurate short-term forecasting, sub-hourly scheduling, and other possibilities.
- Changes to the market system to encourage fast ramping by conventional generation resources.
- Use of demand response as a ramping/load following resource, not just a resource for hourly energy in the day-ahead market or for emergencies.

This study primarily investigated the first two items. Subsequent efforts are recommended to study the effectiveness of ramp limits on renewables and the effectiveness of demand response for load following. Introducing the need for these latter two elements will stimulate the market debate among parties affected. While the study does not offer research to specifically identify the value of limiting renewable resource ramps, this option may play a key role in ensuring the efficient application of capital investment for new flexible capacity in a manner consistent with reducing greenhouse gas emissions at a reasonable cost to consumers.

Second, the use of fast storage as a system resource for renewables management appears to require technical performance characteristics of the various types of electricity storage, in particular, minimum rate of change capabilities of charging/discharging power, such as minimal ramping capabilities. If these are to be imposed as requirements for a new regulation ancillary service then the electricity storage development community needs to be aware before large investments are made in technologies that are not capable of this performance.

Secondary policy issues that were identified include:

- Should electricity storage be directly linked to renewable installations or be procured by the California ISO as an ancillary service on behalf of the system as a whole? Whether renewable developers are required to provide or procure storage capabilities or the California ISO is required to procure it on behalf of the system as a whole will affect the state's generation resource planning. The location of the storage (at the renewable resource's location or elsewhere) will affect the planning of future power transmission lines as well. This question is linked to the question of whether to ramp limit renewables.
- As indicated by this study, procurement of very large amounts of regulation, balancing, and reserves from conventional units may cause market distortions. If so, new market and regulatory protocols may be required.
- What incentives at the federal or state level are indicated to support electricity storage resource development? How should these incentives be linked to policy measures designed to encourage renewable resources development such as tax incentives? Eligible electricity storage should meet the technical performance characteristics identified in this report as validated and amended by the California ISO to qualify. The state may

wish to communicate this concept to the United States Congress, which is contemplating investment tax credits for storage.

- This study used existing California ISO system performance criteria as the benchmark and developed regulation and load following requirements on the assumption that any significant degradation of these is unacceptable. However, North American Electric Reliability Corporation and/or Western Electricity Coordinating Council may establish new performance criteria developed with high Renewables Portfolio Standard operations in mind; should that be the case, then the study would need to be reassessed in light of any new policies.

### **Benefits to California**

The prospective benefits to California from the development of fast electricity storage resources for use in system regulation, balancing, and renewable ramping mitigation are significant.

Specific benefits of fast electricity storage include:

- Management of large renewable energy ramping and management of increased minute-to-minute volatility without degrading system performance and risking interconnection reliability.
- Reduced procurement of very large amounts of regulation, balancing, and reserves from conventional generators, which may be either very expensive or infeasible.
- Avoidance of keeping combustion turbines on at minimum or midpoint power levels to support regulation and load following.
  - Avoids increased greenhouse gas emissions.
  - Avoids higher energy costs due to combustion turbine energy displacing lower cost combined-cycle gas turbines and/or hydroelectric energy.

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## 1.0. Introduction

Renewables integration with the grid has been intensively studied for impacts on production cost, markets, electrical interconnection and grid stability. In the range of dynamic performance from one second to one day, the impact of renewables on frequency response, automatic generation control, and real-time dispatching / load following has largely been studied via statistical and analytic methodologies. These studies have all concluded that there are operational issues raised by the variability and high ramping characteristics of renewables; however, precise quantification of these effects has been elusive. Development of mitigation strategies in terms of market protocols, control algorithms, and the exploitation of new technologies such as electricity storage have lagged, although there has been high interest in the use of electricity storage for system regulation services due to the high prices and market accessibility in the ancillary services market.

### 1.1. Background and Overview

This research aims to assist policy makers in determining the ability of the California ISO system to meet North American Electric Reliability Corporation (NERC) standards under future Renewables Portfolio Standard (RPS) targets and understanding how the California ISO can best integrate and make use of grid-connected energy storage to meet future system operating needs. To do this, the study uses KEMA's proprietary KERMIT model – a high-fidelity dynamic simulation modeling tool that models the system with various levels of incremental regulation and storage, as renewables penetration increases. The model results provide an assessment of the California power system, California ISO control systems, and real-time markets for different renewable scenarios through the 2020 time horizon. In particular, the study investigates the amounts of regulation required, the use of large-scale, grid-connected electricity storage as an alternative to conventional generation, and the tradeoffs in system reserves and scheduling with these approaches. Ultimately, the research attempts to answer technical questions about system needs and capabilities, such as those posed below:

- How much additional regulation capacity does the system need under 20 percent and 33 percent RPS targets?
- Does that capacity change if resources such as storage are assumed, and in what quantity?
- Can the California ISO system withstand a disturbance control standard event with 20 percent and 33 percent renewable resources, assuming that they displace existing thermal resources?
- What is the storage equivalent of a 100 MW combustion turbine (CT)?

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### 1.2. Project Objectives

The primary objective of this study is to determine how the California ISO can best integrate and make use of grid connected storage to meet a variety of system needs from ancillary services, including regulation, spinning reserves, automatic governor control response and balancing energy.

The key project objectives were to:

- Calibrate KERMIT simulator to specific conditions of California ISO.
- Working collaboratively with the California ISO, define simulation approach for days and base cases.
- Model current baseline conditions.
- Determine ancillary levels and generator droop requirements for baseline scenarios.
- Define scenarios for electricity storage.
- Run simulation scenarios.
- Assess alternatives for storage duration parameters and Automatic Generation Control (AGC) algorithms to utilize electricity storage.
- Create and validate requirements for AGC algorithms for electricity storage.
- Identify the relative benefits of different levels of electricity storage.
- Develop requirements for storage characteristics.
- Determine the electricity storage equivalent of a 100 MW gas turbine.
- Identify issues and policies to incorporating large amounts of electricity storage on the California grid.
- Prepare a final report and stakeholder presentation that summarizes results.

Though additional resources may help address renewable integration issues, researchers did not consider them in this study. Cost-benefit analysis of potential tools was also out of the scope of this study. However, researchers believe such analysis is should be taken in context with this analysis to fully inform policy decisions. Additional research recommendations, such as further consideration of forecast error, are provided in the report section on recommendations.

### 2.0 Project Approach

To conduct the analysis, researchers used the proprietary KEMA Renewable Energy Modeling and Integration Tool (KERMIT) simulation model. The KEMA Simulator (Simulator) is implemented in Matlab Simulink, a powerful dynamic systems modeling tool which is often used for generator interconnection studies. Simulink has an optional *Power Systems Toolbox* that includes models of various wind turbines, inverters, and other electrical apparatus. Detailed simulation was required to investigate the impact on frequency regulation and first contingency stability, resulting from a very high penetration of steady and intermittent renewable resources (up to 7,743 MW in 2012 and 26,234 MW in 2020). The time domain of interest for the regulation and real time dispatch study is in a 1-second to 1-day regime. This regulation / dispatch time domain represents a gap in the existing renewables impact assessments performed to date and requires a detailed dynamic simulation in order to properly understand the impacts of renewable volatility as well as to develop mitigation plans. KERMIT features allow researchers to adjust intermittent resource volatilities and the management of dispatchable renewable resources.

The overall approach, which made use of the KERMIT model, is shown in Figure 1.

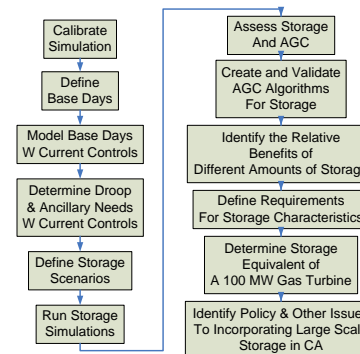


Figure 1. Project steps flow chart  
Source: KEMA researchers

The following sections discuss each task carried out to accomplish the project objectives. An introduction to the KERMIT model and an overview the model simplifications and scenarios run follow first.

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## 2.1. Simulation Summary

Over 500 different simulations were run, examining a variety of system, regulation, and electricity storage parameters against the four days and three future renewable scenarios selected (plus five days for the current year for calibration). Table 2 below summarizes the cases studied.

Table 2. Scenario summary of approaches taken by research team

Source: KEMA researchers

Year / Renewable Scenario	Current	20% RPS	33% RPS Low Estimate	33% RPS High Estimate	Comments
<b>Project Study Element</b>					
<b>Calibration</b>	All days plus one June day*	N/A	N/A	N/A	June used a unit trip to calibrate frequency response of system
<b>Determining Impact of Renewables under Current AGC</b>	All days	All days	All days	All days	February, April, July, October
<b>Determining Levels of Regulation Required to Accommodate Renewables</b>	N/A	All days	All days	All days	Cases studies with AGC values of 400 - 3,200 MW all cases, and 4,000/4,800 MW where required
<b>Determining Levels of Regulation Required to Accommodate Renewables</b>	N/A	None	None	July Day	Cases with 2,400 - 4,000 MW of regulation were modified to keep all CT's on providing regulation
<b>Determining Levels of Regulation Required to Accommodate Renewables</b>	N/A	None	None	All days	Cases were run with 800-3,200 MW of regulation was allocated to a CT and Hydro subset, matching 3,200 MW regulation level
<b>Determining Levels of Storage Required to Accommodate Renewables (Infinite Storage Approach)</b>	N/A	All days	All days	All days	Cases studied with storage levels of 10,000 MW and 12 hr duration
<b>Validating Storage Levels and Determining Durations</b>	N/A	All days	All days	All days	3,000 MW and 4,000 MW cases validated across duration ranges 1 - 4 hrs
<b>Developing and Validating Storage Control Algorithm</b>	N/A	None	None	July Day	Many cases run with various schemes and then with all combinations of PID tunings. Selected controls/tuning were used in subsequent cases
<b>Determining Storage Rate Limit Requirements</b>	N/A	None	None	July Day	Cases run with storage rate limits varying from 2.5 to 100 MW/second. Resulting 10 MW/sec were used in all subsequent cases
<b>Examining Trade-offs of Storage and Regulation</b>	N/A	None	None	All days	Cases with varying combinations of regulation and storage totaling as much as 5,000 MW

Year / Renewable Scenario	Current	20% RPS	33% RPS Low Estimate	33% RPS High Estimate	Comments
<b>Examining Trade-offs of Storage and Regulation Against Real Time Dispatch Periodicity</b>	N/A	None	None	July Day	Cases with varying combinations of regulation and storage re-run with RTD @ 30 seconds
<b>Examining Trade-offs of Storage and Regulation</b>	N/A	None	None	July Day	Sensitivity analyses of incremental 100 MW regulation or 100 MW storage across range of regulation/storage combinations
<b>Examining Trade-offs of Storage and Regulation</b>	N/A	None	None	July Day	Trade-offs were re-examined with the regulation allocation used above for a subset of CT and hydro units
<b>Droop Investigations</b>	N/A	None	None	July Day	Droop was doubled on all conventional generators and results studied
<b>Analyzing Storage Equivalent of 100 MW CT - base cases</b>	N/A	None	None	All days	Analyzed for a range of AGC Regulation MW used from 800 to 3,200 using the Regulation Allocation to only a subset of CT and Hydro units
<b>Analyzing Storage Equivalent of 100 MW CT - base cases</b>	N/A	None	None	All days	Analyzed for a range of AGC Regulation MW used from 800 to 3,200 MW with a 110 MW CT added
<b>Analyzing Storage Equivalent of 100 MW CT - base cases</b>	N/A	None	None	All days	Analyzed for a range of AGC Regulation MW used from 800 to 3200 MW with 50 and 100 MW storage added
<b>Emissions Impacts</b>	N/A	July Day	July Day	July Day	Emissions from CT and CCGT were calculated across various regulation and storage cases

\*All days refers to the four total sample days; one day in each month of February, April, July and October.

While the research conducted here provides several useful conclusions, the model made simplifications that should be considered further. In particular, literally hundreds of second by second simulation of the California power system were performed for each of the four days and four renewable scenarios developed. These simulations produced the conclusions and results described above. The conclusions and recommended control algorithms and dispatch protocols need to be validated across a much larger sample of days than the four seasonal typical weekdays chosen.

In addition, the study was optimistic in that the impact of large forecast errors for renewable production, especially forecast errors associated with wind production, were not studied. The wind forecast errors assumed in the scheduling and dispatch were not significant. Addressing larger wind power forecast error problems will likely emphasize the benefits of electricity storage compared to conventional generation used for regulation, as these units would have to be kept on for longer periods in order to provide against forecast error.

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To develop scenarios, the study observed renewable production for sample days and then scaled these up for the renewable scenarios. This methodology was the only practical approach in the time frame with the data available to the California ISO. As such, it tends to reduce the impact of geographic diversity on the renewable ramping characteristics. While data across the West Coast seems to indicate that this geographic diversity is not as large a factor as might be thought, it will be an important point of discussion needs further analysis. The California ISO is conducting an analysis of the correlations of wind power geographically today. The results of this could be used in another research phase that examines most or all of the days in a year to understand the statistics of system ramping requirements. (The system has to be able to withstand the expected worst case scenario for coincident ramping seasonally. It cannot be designed and operated for averages).

The California ISO did not have available projected hourly schedules for the conventional generation against the different renewable scenarios nor could those have been practically adapted to various reserve and regulation levels studied were they available. As the projected hourly schedules for conventional units become available, these can be iteratively combined with the renewable ramping solutions to further validate and refine both the production costing and dynamic performance conclusions. The limited investigations that the project made of this topic showed that system performance varies with the allocation of regulation to conventional units in ways that vary from one day to the next, not always intuitively apparent. The interaction of energy scheduling, reserve and regulation allocation, and system performance when very high levels of regulation are procured is extremely complex.

The study used assumptions by the California ISO about how much of the state wind power would actually be purchased from wind developers located within the Bonneville Power Administration control area and how much of those resources would be *levelized and balanced* by BPA versus the California ISO. These assumptions will greatly affect outcomes and thus need to be monitored and adjusted as contracts are negotiated. Related to this is the conclusion in the study that the Western Electricity Coordinating Council (WECC) system frequency is not at risk as much as the California ISO Area Control Error (ACE), due to the size of the interconnection. However, if significant additional renewable resource penetration is assumed across the WECC, this result will be optimistic. Therefore, the extension of the study to broader WECC issues (where geographic diversity will have a larger favorable impact) is probably a topic for discussion between the California ISO and WECC.

Finally, the study scope did not include examination of the costs of either greatly increasing procurement of ancillary services or of deploying large amounts of grid connected storage. Such a cost benefit tradeoff requires forward projection of these costs, which is somewhat speculative. These cost benefit tradeoffs can be developed for hypothetical future developments on the economics (including carbon cap and trade) of conventional generation and of storage technologies. A commitment by the state to a single strategy using today's economics will not be as wise as a continuous adoption of strategies as costs and technologies evolve.

This research maintained control area performance at today's levels. It may be that NERC will have to reexamine Control Performance Standard (CPS) criteria in light of higher penetration of

renewables and establish new goals appropriate to the interconnections and the anticipated geographic diversity of renewables as well as what frequency deviation and tie deviation the interconnection can tolerate. Toward this purpose, a WECC-wide study similar to this one is an advisable next step.

## 2.2. Modeling Tool

### 2.2.1. Introduction to KERMIT

The KERMIT model is configured for studying power system frequency behavior over a time horizon of 24 hours. As such, it is well-suited for analysis of pseudo steady-state conditions associated with Automatic Generation Control (AGC) response including non-fault events such as generator trips, sudden load rejection, and volatile renewable resources (e.g., wind) as well as time domain frequency response following short-time transients due to fault clearing events.

Model inputs include data on power plants, wind production, solar production, daily load, generation schedules, interchange schedules, system inertias and interconnection model, and balancing and regulation participation. Parameters for electricity storage are also inputs – power ratings, energy capacity or *duration* of the storage at rated power, efficiencies, and rate limits on the change of power level. Model outputs include ACE, power plant output, area interchange and frequency deviation, real-time dispatch requirements and results, storage power, energy, and saturation, and numerous other dynamic variables. Figure 2 depicts the model inputs and outputs.

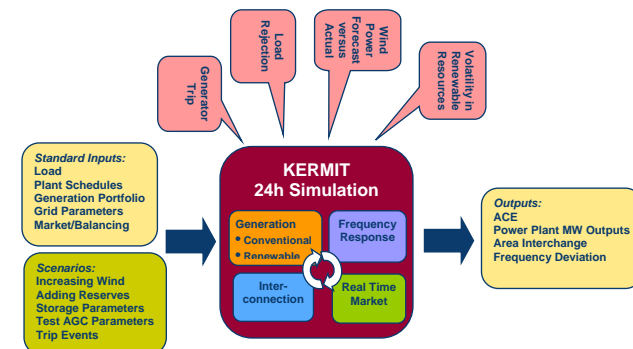


Figure 2. KERMIT model overview  
Source: KEMA researchers

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Microsoft® Excel-based dashboards allow the creation of comparative analyses of multiple simulations across control variables and the generation of time series plots of key dynamic variables with multiple simulation results co-plotted for easy comparison. Pivot table analysis allows the 3-D plotting of key metrics (such as maximum ACE) across multiple simulations and scenarios. As one simulation will provide a minimum of three or four dynamic plots of interest (maximum of 20+) and a half dozen to dozen key metrics, and there are at least 4 days x 4 renewables scenarios for any selection of variables some mechanism to identify key results, compare them across variables, and present them effectively is essential given the large amount of data created during a project such as this.

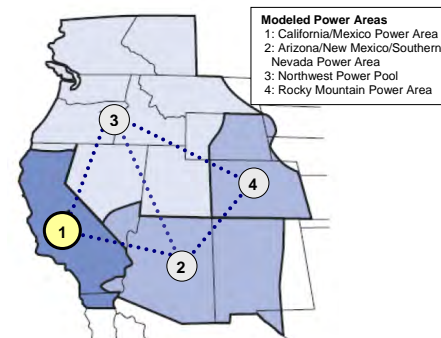
The model has a number of useful features aimed at making it effective for analyzing California ISO-specific conditions and different scenarios including:

- Spreadsheet-based data to represent regional power plants.
- Use of actual interchange schedules and load forecasts from typical California ISO data.
- Analysis of dynamic performance of the power system, the AGC, the generation plants, storage devices:
  - Power spectral density analysis, which allows comparison of hour to multi-hour time series (i.e. ACE, plant actual generation, frequency) by mathematical means.
  - Computation of NERC CP51 performance and statistics.
  - Computation of useful statistics such as max over a time period, averages, and so on.

It is possible to make direct comparisons of different cases to highlight the results of changes from one scenario to the next, such as increased wind development, increased use of regulation for the same scenario, impact of varying levels of storage, impact of different control algorithms and tuning, and comparison of completely different strategies such as storage versus increased ancillaries. These are presented statistically and were turned into Excel pivot tables, or more typically, combined on MATLAB plots to show time series from different cases on the same plots.

### 2.2.2. Model of California

To account for interactions between the California/Mexico Power Area (CAMX) and other inter-tied WECC regions, researchers modeled the California market as connected with three other areas. These regions are based on the WECC reporting areas and include the Northwest Power Pool (NWPP), the Rocky Mountain Pacific Area (RMPA), and the Arizona, New Mexico, and southern Nevada (AZNMSNV) Power Area. Figure 3 depicts the four WECC regions along with the modeled interconnections. The approach effectively models each external area as another generator with inertia.



**Figure 3. WECC reporting areas and model interconnections**

Source: Based on WECC. WECC Reporting Areas. Viewed 2009.

Available on-line: <http://www.ferc.gov/market-oversight/mkt-electric/wecc-subregions.pdf>

To model the flow between areas, researchers used Equation 1. The calculation redistributes power according to swing dynamics. The phase angle changes as exports, or *production* slows up and speeds down.

### Equation 1. Area interconnection

$$\text{FLOW}_{i,j} = P_i \times \sin(\phi_i - \phi_j)$$

Where,

FLOW = power flow  
 $P_i$  = power  
 $\phi_i$  = phase angle  
 $\phi_j$  = phase angle

The California ISO provided researchers with historical wind power, concentrated solar generation, and daily load data in time series, along with hourly generation schedules for individual plants within CAMX for each of the sample days. Researchers modeled four types of conventional generation – nuclear, coal, gas-fired (CT and combined cycle), and hydropower. Information on inertia and droop, load inertia and frequency response and generator time constants were also provided by the California ISO. The project team developed *typical* balancing and regulation participation and balancing market bids for the units. As noted above, all units were assumed to be available for participation in balancing and regulation (except nuclear and miscellaneous smaller units). Researchers used additional data from OSIsoft PI system™ (PI Historian) provided by the California ISO for the sample days, available at a 4-

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second time resolution. This data included system frequency, Area Control Error (ACE), interchange schedules, and total system generation for all areas modeled in the analysis.

### 2.2.3. System Performance Metrics

All balancing authorities are required to meet the NERC Resource and Demand Balancing Performance Standards (BAL Standards)<sup>14</sup>. The BAL Standards are very prescriptive in describing what the Balancing Authorities are required to do to control ACE and system frequency. In this analysis, ACE and frequency deviation are used as metrics of system performance. ACE is a combination of the deviation of frequency from nominal, and the difference between the actual flow out of an area and the scheduled flow. Ideally the ACE should always be zero. Because the load is constantly changing, each utility must constantly change its generation to *chase* the ACE. Automatic generation control (AGC) is used to automatically change generation to keep the ACE within the tolerance band which is annually established for all Balancing Areas. The California ISO calculates ACE based upon tie line flows and frequency and then the AGC module sends control signals out to the generators every couple of seconds. Equation 2 shows the formula used to calculate ACE in the model.

#### Equation 2. Area control error

$$ACE = 10 \times \text{Bias} \times \text{Frequency Error} + \text{Interchange Deviation}$$

Where,

10	= constant, converts frequency bias setting to MW / Hz
Bias	= frequency bias setting, bias value used by the control area (MW / 0.1 Hz)
Frequency Error	= the difference between actual and scheduled system frequency (Hz)
Interchange Deviation	= the difference between actual and scheduled interchange (MW)

The system frequency error is also available for plotting and statistical analysis, as is the Interchange Deviation. In addition, the *power spectral densities* of the ACE and frequency signals were computed.<sup>15</sup> This is primarily useful in establishing that the base system performance in 2008 and 2009 is consistent between simulated and actual data. Finally, researchers computed statistics on NERC Control Performance Standards (CPS), CPS1 and CPS2.<sup>16</sup> Various statistical measurements of these signals such as absolute maximum are also available.

<sup>14</sup> The NERC BAL Standards are available on the NERC website at <http://www.nerc.com/page.php?cid=2120>

<sup>15</sup> *Power spectral density* is a function that expresses how signal power is distributed with frequency in time series data. It is expressed as power per frequency. Power spectral density analysis is useful for comparing time series data as it illustrates the periodicities observed in oscillatory signals.

<sup>16</sup> Control performance standards are statistical reliability standards specified by NERC, which limit a Balancing Authority's ACE over a specified time period. CPS1 is a statistical measure of ACE variability, and CPS2 is statistical measure of ACE magnitude. Sources include:

1. NERC. "Glossary of Terms Used in Reliability Standards." February 2008. Available on-line at [http://www.nerc.com/files/Glossary\\_12Feb08.pdf](http://www.nerc.com/files/Glossary_12Feb08.pdf)  
2. NERC. "Control Performance Standards." February 2002. Available on-line at <http://www.nerc.com/docs/oc/ps/tutorcps.pdf>

Because renewables ramping effects are as critical as volatility, the performance of the system real time dispatch as simulated is also valuable. The system incremental and decremental real-time MW (INC/DEC) and the marginal clearing price (MCP) are also computed, plotted, and analyzed. The KERMIT model uses a simple real time dispatch analogous to the former California ISO RTD algorithm rather than a multi-hour commitment algorithm. This was deemed sufficient by the California ISO for the purpose of this project.

### 2.3. Task 1. Calibrate Simulation

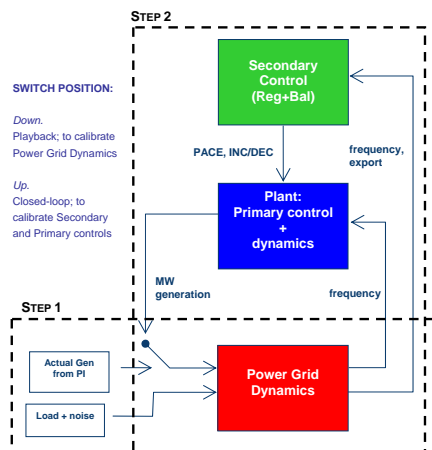
To obtain validity in model predictions, the team began by calibrating the simulation using 2008 and 2009 data. This process entailed adjusting model parameters until simulation output matched actual historical 2008 and 2009 performance data. While results were not intended to be exact, researchers harmonized certain basic system characteristics so that results were representative of today's market and system performance. In particular, researchers looked for realistic AGC behavior, fidelity in matching unit trip response and reasonable match to real-time prices. Data used to match these characteristics included:

- Area Control Error
- System frequency data
- Real-time price data.

Actual generator bid data is confidential and therefore was not available to the research team. To gauge real-time price outputs, researchers created synthetic bid data, which was subsequently reviewed and accepted by California ISO as a suitable proxy. Researchers assigned a typical bid number to units participating in balancing and validated that day-ahead, market-clearing prices fit within expected results.

The calibration process was done in two steps. The first step focused on power grid dynamics while the second step focused on primary and secondary controls. Figure 4 is a schematic of the calibration process, with the areas of focus for steps 1 and 2 each outlined in the respective boxes.

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**Figure 4. Calibration process**  
Source: California ISO

The goal of step 1 was to adjust KERMIT model inputs to produce interchange and frequency signals which match the behavior of the historical data. Researchers inputted actual recorded generation data and used pre-processing to *recover* load and noise from available data. In particular, researchers solved the power flow for the four-area system shown in Equation 1 at appropriate time intervals using injection data from PI Historian. From this power flow solution, researchers computed the frequency of each area throughout the sample day. Reversing the *swing dynamics* using second-order differential equations allowed recovery of the load and noise values.

The goal of step 2 was to calibrate the full model, including the modeling of primary and secondary generating plant controls. Here, researchers ran the model as a closed loop simulation. Researchers fed the model's primary and secondary controls with the validated frequency and interchange output from step 1. Researchers then examined the model's ability to produce a *MW generation* signal that matched that of historical data from PI Historian.

One issue encountered in the calibration process was that the model initially produced noisier ACE than real world (i.e., it crossed the zero axis more often). Researchers tuned the model by adjusting load noise to best match the historical ACE as best as possible (e.g., match frequency

of zero ACE crossings, bandwidth). This tuning involved substituting load noise recovered from the PI Historian data in place of applying random noise.

In the absence of real bid data for the sample days, the researchers created synthetic bid data that was reviewed and accepted by California ISO as a suitable proxy. This data was required for the operation of the real time dispatch. However, identifying which unit was used to provide incremental MW by the dispatch is not significant to this study. It is the general response of classes of units that affects system performance and ramping and typical dispatch results were the objective.

### 2.4. Task 2. Define Base Days

As the basis for simulating future conditions in 2012 and 2020, researchers worked with the California ISO to select four days to model for assessing future renewables' impact. Additionally, one 2009 day with a major unit trip was used to calibrate system frequency response to a large disturbance. Simulation of these selected days under future scenarios demonstrates the impact of renewables integration on AGC performance and balancing costs. Thus, the simulation days chosen by researchers, in conjunction with the California ISO, include four typical days, one in each of the four seasons, and one event day.

Data for each base day included four second system load and system generation data, photovoltaic and concentrated solar production, wind production, interchange data, frequency, ACE and AGC from the 2008 and 2009 time period. To develop 2012 and 2020 scenarios, researchers adjusted base day time series data to incorporate anticipated load growth and renewable resource development. Anticipated load growth for 2012 and 2020 were derived using the latest California Energy Commission load forecast projections<sup>17</sup>. Assumptions about renewable resource development were made using the latest information on what new generation is in *queue* for California ISO interconnection planning and the CPUC / E3 study on 33 percent renewables. As there is uncertainty about renewable resource development for 2020, researchers prepared a *low* 2020 scenario and *high* 2020 scenario.

In selecting four of the base days, researchers intended to capture the seasonal variation of renewable production. In particular, the model runs over a 24-hour time period. By selecting multiple base days, the analysis assesses typical renewable output profiles for those times of the year. The four seasonal days selected were Wednesday July 9, 2008; Monday, October 20, 2008; Monday, February 9, 2009; and Sunday, April 12, 2009.<sup>18</sup>

An additional base day illustrated system performance where a large generating unit tripped. This allowed researchers to gauge system trip response under current conditions (to help calibrate the model), as well as to consider a future system performance where larger amounts renewable production are on-line and a traditional generating unit trips. The event day selected

<sup>17</sup> California Energy Commission. *California Energy Demand 2010-2020 Staff Revised Forecast*. 2009. Available on-line at <http://www.energy.ca.gov/2009publications/CEC-200-2009-012/>

<sup>18</sup> Some of the four seasonal days also had disturbances. However, these were relatively minor.

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was June 5, 2008. On that day, the California ISO SONGS Unit Number 2 relayed while carrying 1,095 MW. System frequency deviated from 59.998 to 59.869 and recovered to 59.924 by governor action.

## 2.5. Task 3. Model Study Days for 20 Percent and 33 Percent Renewables With Current Controls

### 2.5.1. Introduction

Once researchers calibrated the model to best match the 2008 and 2009 historical data and system performance, researchers then modeled the study days for 20 percent renewable and 33 percent renewable scenarios. Because no forecast data was available at the detail needed for modeling, researchers scaled up the existing time series for production from the renewable resources to reflect projected capacities in 2012 and 2020 to simulate future scenarios. This section describes characteristics of the study days selected for the analysis and illustrates the projection to future years with data from July. Data for all days is available in the appendix.

### 2.5.2. Load

Future load estimates were derived from the preliminary demand and energy forecast of the 2009 Integrated Energy Policy Report (IEPR), shown in Figure 5.

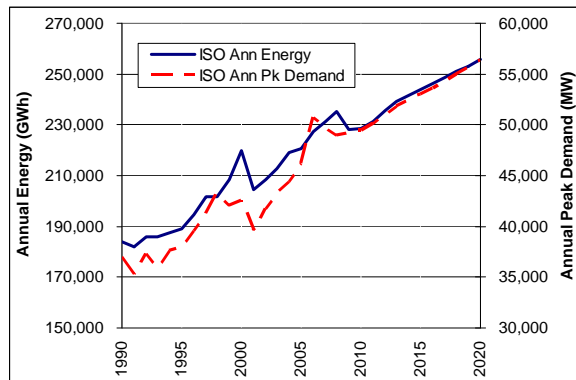


Figure 5. California Energy Commission preliminary demand and energy forecast to 2020  
Source: IEPR 2009

To derive load size in 2012 and 2020, researchers applied the same percentage increase in load from the IEPR forecast to the base day load amounts. As illustrated in Figure 6, growth in the peak load through 2020 is forecast at approximately 1.2 percent per year.

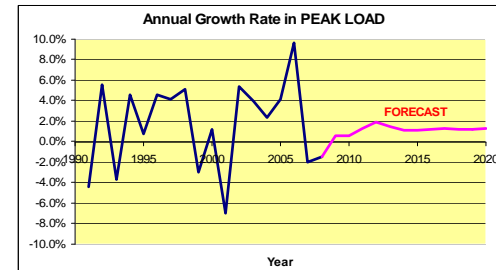


Figure 6. Annual growth rate in forecasted peak load

Source: IEPR 2009

To account for variability in load while aligning future load estimates with projections of load growth, researchers scaled up the base day time series by a factor of 1.049 percent for 2012 and 1.127 for 2020. Figure 7 illustrates the daily load variations for the 2009 base days.

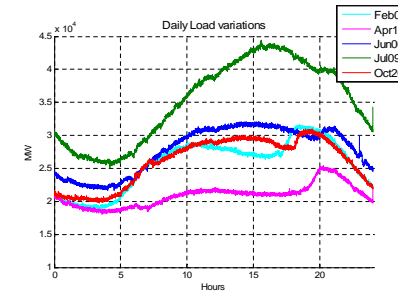


Figure 7. Daily load variation for each of the base days

Source: California ISO data and model outputs, respectively

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### 2.5.3. Renewable Generation

To model future generation profiles of renewable energy, researchers scaled base day time series to reflect projected capacities in 2012 and 2020. Researchers modeled distributed renewable generation in the aggregate. Table 3 shows the generation capacities used in the 2012 and 2020 cases, as compared to 2009 amounts, for photovoltaic (PV), concentrated solar generation (CS), and wind power. These values were provided to the research team by the California ISO, based on projects currently in the interconnection queue which would realize the 20 to 33 percent renewable portfolio standard level. Between 2009 and the high case for 2020, wind generation nameplate capacity increases by over fourfold.<sup>19</sup> Concentrated solar generation increases by a factor of 25 over the same time period.

Table 3. Generation Capacity by Type (MW)

Year	2009	2012	2020 low estimate	2020 high estimate
PV	400	830	3,234	3,234
CS	400	996	7,297	10,000
Wind	3,000	5,917	10,972	13,000

Source: model outputs

#### Wind Power

Given time series of past wind production and the expected wind generation capacity from Table 3, researchers developed future wind energy production time series with scaling. Researchers used two sets of time series wind data from the NP15 EZ Gen Hub and the SP15 EZ Gen Hub, depicted in Figure 8.

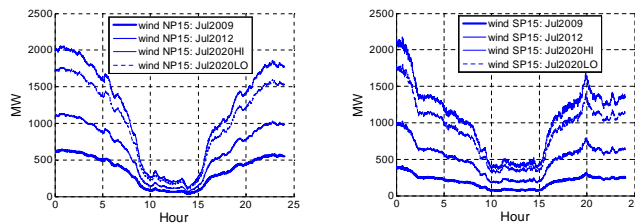


Figure 8. Regional wind production data

Source: model outputs

<sup>19</sup> While the model uses nameplate capacity projections to forecast wind production capacity, the time series data from the base days determines how much capacity is ultimately used for energy production.

An estimated 3,000 MW capacity of the future wind power resource is anticipated to come from wind farms located with the Bonneville Power Administration (BPA) control area. The California ISO determined that the project should use the following assumptions about these resources:

- Their daily production would parallel the NP 15 production patterns. (This was based on comparisons of some representative wind productions available.)
- Fifty percent of this wind would be balanced by BPA such that imported power would be leveled to the California ISO control area.

The wind power simulated reflected these assumptions.

#### Concentrated Solar Generation

Time series data for typical concentrated solar generating units was available from the California ISO. Quite often, CS generation is used in conjunction with gas firing to extend its production. The data used here contains that assumption. This reduces the time between the fall off of concentrated solar production and the ramp-up of wind production by varying amounts according to day and season.

Researchers scaled up the time series data to match future expected capacities across the scenarios. These then served as scenario inputs for the model. Figure 9 illustrates the concentrated solar production time series for the July days.

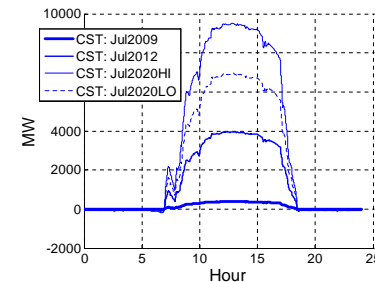


Figure 9. Concentrated solar generation time series for July scenarios

Source: model outputs

#### Photovoltaic

Because limited public data was available, researchers simulated PV generation to develop a PV time series for the KERMIT model. Direct inputs for this PV model are temperature and solar

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intensity time series data obtained from NOAA. Researchers obtained the time series for the base and study days, using a weather station site near Sacramento. Indirect inputs are related to panel characteristics such as electrical and tilt and details of the surrounding environment, such as clouds and albedo.<sup>20</sup> A random model was used to represent cloud movement. The resulting PV time series data was scaled up for 2012 and 2020, based on the PV capacities expectations for these years, listed in Table 3, above. Figure 10 depicts the time 2012 and 2020 time series for the July day. These simulated photovoltaic time series align well with other estimates of California PV studies.

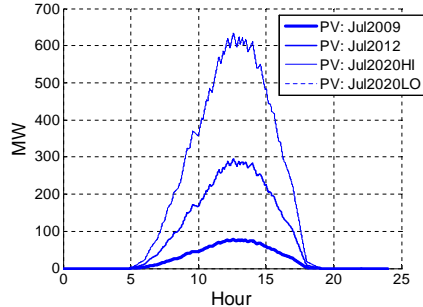


Figure 10. Time series of photovoltaic production for July scenarios  
Source: model outputs

#### 2.5.4. Forecast Error

Researchers constructed a time series wind forecast based on actual historical wind data provided by the California ISO. Both the approximated wind forecast error and actual wind production are used in the simulator. Figure 11 depicts this approximated forecast error for July 2009.

<sup>20</sup> The term albedo (Latin for white) is commonly used to applied to the overall average reflection coefficient of an object.

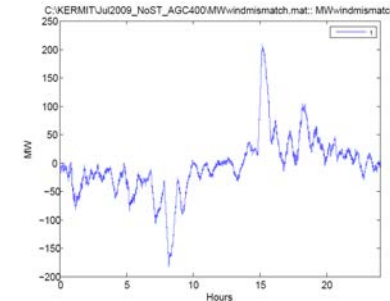


Figure 11. Wind forecast error for July 2009 scenario  
Source: model output

This project scope did not include assessing wind power forecast accuracy nor projections of how this might improve in the 2009 to 2020 time horizon. The actual forecast for the representative days in 2009 was used and scaled up along with the production for the 2012 and 2020 scenarios. The methodology of the project assumed therefore that the hourly scheduling for conventional units matched relatively accurate wind forecasts. For the purposes of determining balancing and regulation requirements, and the utilization of storage, in order to accommodate expected renewable resource production, this is valid. It does not address the potential larger balancing requirement and impact on scheduling reserves, which might be necessary to manage large wind forecast errors.

#### 2.5.5. Conventional Unit De-commitment Approach

The original project plan envisioned that energy production schedules for conventional units for the 2012 and 2020 scenarios, schedules that would reflect the higher levels of energy from renewable generation, would be available. However, these production schedules were not available in the time frame required for this study. Using the 2009 schedules for conventional units would not have been realistic as they would not have factored in load growth nor the displacement of conventional generation as a result of high renewable production. Therefore, a different strategy had to be created to develop the required generation schedules for the 2012 and 2020 study days.

The researchers developed a future unit commitment schedules by using the 2009 schedule data and factoring in the significant increase in renewable generation for the future year cases. This included adjustments to the 2009 generation schedules in order to de-commit thermal units appropriately to make room for the energy from the additional renewable generation. This entailed comparing the total of renewable generation plus the conventional generation unit commitment schedule by hour vs. the hourly load projection, then de-committing thermal units

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to match the hourly load. This de-commit process first shut off combustion turbines (CTs) by merit order, followed by combined-cycle gas turbine plants (CCGTs) in merit order as needed until total hourly generation matched load.

For the purpose of the 2012 and 2020 cases, hourly interchange assumptions matched the 2009 hourly interchange data except for adjustments related to new imports of wind resources anticipated from BPA, which were added on top of the 2009 hourly interchange schedules.

These measures produced unit schedules for the conventional units that were reasonably consistent with the wind and solar production for the study days as scenarios for 2012 and 2020. Planned generating unit retirements and planned unit repowering due to once-through cooling requirements and other changes in unit capacity or rate limit performance were also factored into the 2012 and 2020 scenarios so as to have as accurate a picture of the conventional fleet as possible.

Figure 12 illustrates the de-commitment model used by the researchers. The unit retirements and capacity changes plus the typical adjusted unit schedules for the base and study days are contained in the appendix.

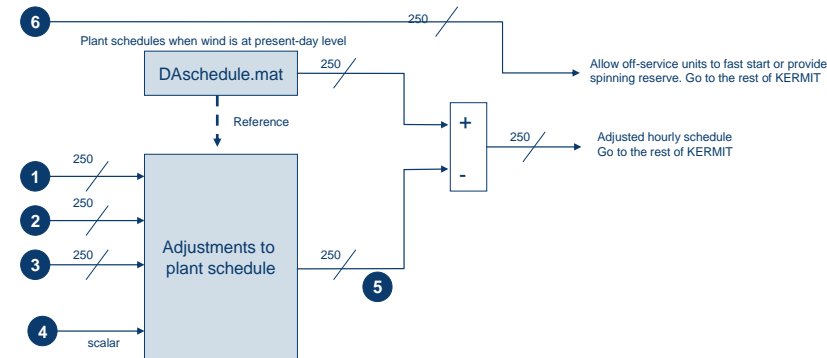
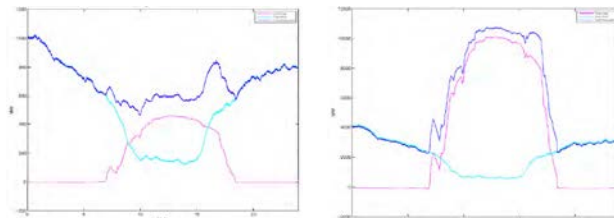


Figure 12. De-commitment model representation used by researchers  
Source: KEMA researchers' model

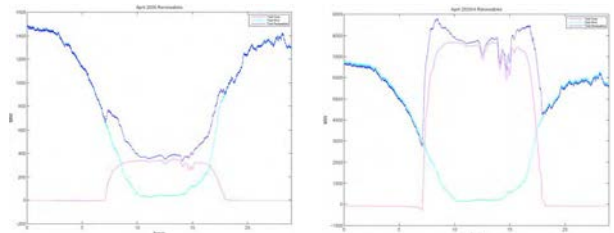
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**2.5.6. Total Renewable Production and Conventional Unit Production**

Figure 13 compares the total assumed renewable production between 2009 and 2020 High. Figure 14 shows the same for April. On both days, the 2012 and 2020 load shapes for wind and solar are comparable to the 2009 cases. However, they are scaled up to match forecast projections. The hourly profile of total renewable production is heavily dependent on the relationship of wind to solar. In all cases, total wind production ramps down in the morning as solar ramps up and ramps up in the evening as solar ramps down. However, the extent of ramping varies. As noted earlier, the California ISO modified the observed concentrated solar production for each day to simulate the use of gas firing to extend the concentrated solar production an extra two hours. This reduces the time between the fall off of concentrated solar production and the ramp up of wind production by varying amounts according to day and season.

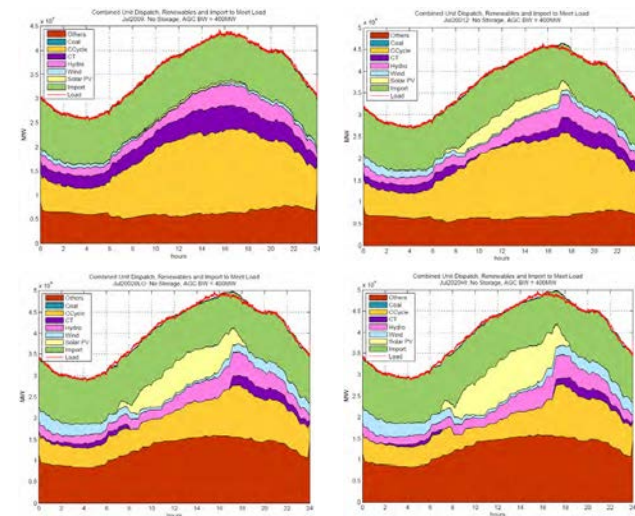


**Figure 13. Renewables production for July 2009 and July 2020 scenarios**  
Source: model outputs



**Figure 14. Renewables production for April 2009 and April 2020 scenarios**  
Source: model outputs

The total renewable production by type and the conventional unit production by type are shown in Figure 15 for the July days simulated in the 2012 and 2020 Low and High scenarios. (The renewable production for all days is contained in the appendix). Across the scenarios the generation portfolio changes, with wind power and solar PV generation increasing in share and combustion turbines and combined cycle generation decreasing. Hydropower and generation imports experience more minor changes in total share, with scheduling being the predominant difference. The differences between 2020 High and 2020 Low cases are less pronounced, but the types of portfolio changes are similar.



**Figure 15. Generation by type and load for July days in 2009, 2012, and 2020**  
Source: model outputs

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### 2.6. Task 4. Determine Droop and Ancillary Needs With Current Controls

#### 2.6.1. Ancillary Needs

In 2008, the California ISO required about 390 MW of upward AGC capability and 360 MW of downward AGC capability to adequately regulate system frequency. It runs a separate market for positive and negative regulating service, so the amounts of these ancillaries that are procured may be asymmetric. The addition of large amounts of wind and solar renewables, which have rapid and uncontrolled ramp rates, can be expected to increase regulation requirements. The researchers assessed the amounts of regulation needed in future RPS scenarios and determined the impact on system performance with different levels of regulation. For study purposes, the researchers assumed an equal positive and negative (e.g., symmetrical) regulating requirement. Thus, the report simply refers to regulation bandwidth or AGC bandwidth (where a BW of X MW infers procurement of AGC for a range of +X to -X).

Under typical circumstances the California ISO's frequency regulation needs are achieved today by having about a dozen generators on AGC control in order to meet its WECC/NERC frequency performance obligations. However, under high renewable scenarios, the number of units needed on AGC may need to be many times greater. In addition to AGC service, the California ISO also operates a balancing energy market to respond to deviations between the scheduled and actual level of generation output on an hour-to-hour basis in real-time operation. Although balancing energy responds at a slower rate than AGC, the operation of both of these markets overlap significantly, and they both impact the California ISO's overall frequency and ACE performance. Therefore, both AGC and balancing energy needs are examined in this study.

After establishing a baseline AGC performance based on historical data, the research analyzed the extent to which renewables might degrade the performance of system frequency regulation in the 2012 to 2020 time frame. Researches hypothesized changes in the future regulation levels to be procured through the ancillary services markets and investigates the impact of different levels via simulation of system frequency response using the KERMIT model. The goal was to determine acceptable levels of AGC performance and balancing energy requirements under RPS levels in 2012 and 2020.

The current California ISO AGC bandwidth was assumed to be  $\pm 400$  MW. A key unknown is how regulation will be provided for renewables to be imported by the California ISO from BPA. For the purpose of this study, it was assumed that 50 percent of that regulation responsibility would be provided by BPA and 50 percent by the California ISO.

Future regulation bandwidth requirements were determined by increasing the regulation bandwidth in increments until ACE and frequency performance for the 2012 and 2020 scenarios were consistent with 2009 performance. The 2020 High scenario required very large amounts of regulation. Consequently, in order to ensure that units with higher ramp rates were available to provide sufficient regulation, some additional cases were run where all the CTs and hydro units

remained on at 20 percent minimum so as to have the required regulation bandwidth available. (Otherwise regulation duty would fall on CCGT and other slower units, degrading performance).

#### 2.6.2. Governor Droop Settings

Researchers also examined the potential impact of adjustments to governor droop settings. Governor droop setting is a measure of the automatic increase (governor response) in the energy output of a generating unit measured in MWs /0.1Hz due to a frequency deviation on the system and expressed as a percentage of typical system frequency. The research team simulated cases where droop on conventional units was changed from today's standard of 5 percent to double that amount, 10 percent.

#### 2.6.3. Real-Time Dispatch

System reserves, real-time / balancing energy requirements, and AGC bandwidth are all interlinked. In order for the system to have large amounts of AGC bandwidth available, it must have corresponding amounts of reserves available from the generator schedules. Determination of AGC bandwidth and balancing energy requirements develops the requirements for reserves that would be used in developing the hourly schedules for conventional units.

The real-time dispatch algorithm in KERMIT approximates the former balancing energy market real-time dispatch (RTD). It is a straightforward auction model of increment and decrement bids from participating plants. For the purposes of this project, the RTD market is quite deep – several thousand MW of available increment and decrement. The algorithm accepts as input a MW required figure, which is the sum of total supply – all conventional and renewable generation, actual imports, plus actual storage power output. It subtracts from these the total import and generation schedule to arrive at total incremental or decremental MW required. It can also add the filtered ACE in as a requirement as well. Thus, RTD serves to reallocate the total generation and error to the generators on a bid economics basis. RTD nominally runs every five minutes but can be run at any frequency.

### 2.7. Tasks 5 Through 7. Define Storage Scenarios and Run Simulation and Assess Storage and AGC

The goal of this task was to define storage facility scenarios above and beyond the existing pumped storage facilities that exist in California (e.g., Helms and Castaic plants). The researchers began by using an infinite storage capacity model in order to see how much would be used by the system for each of the modeled days in 2012 and 2020. For this purpose *infinite storage* was defined as 10,000 MW with a 12-hour discharge duration. The amount of power used from this stored energy source used by the model in 2012 and 2020 provides an indication of how much storage power capacity is required in various RPS and AGC scenarios. The energy used (charging or discharging) during major ramping periods is an indication of the energy needed.

The maximum power utilized from the *infinite* storage was used to develop the approximate sizes of storage to be used as *required* for validation. The approximate duration of storage was estimated by examining the time that the storage power from the infinite unit went between

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zero crossings as an approximation. From the plots of *infinite* storage developed for the scenarios, some approximate estimates of required configurations in each day/scenario were developed. For simplicity these configurations were reduced to round numbers; e.g. *two hour* durations. This methodology avoided iterating through numerous simulations with different storage levels to identify required needs.

In addition, the researchers examined the impact of increased regulation amounts on the system. In particular, researchers ran the scenarios with multiple amounts of storage to observe the impact on system metrics. To observe large amounts of regulation, researchers constrained generation schedules to maintain combustion turbines *on* during the day and available for regulation service so that these very high levels of regulation could be realistically provided.

### 2.8. Task 8. Create and Validate AGC Algorithm for Storage

Automatic Governor Control (AGC) control algorithms for system storage that had been developed in prior studies proved inadequate for the ramping problem, even though they were sufficient in *normal* conditions. This had to be rectified before storage requirements could be developed, both for the conventional generators and for storage. Therefore, the next focus was to assess how to most effectively integrate storage with system operations and real-time market operations. This included testing of improvements to the AGC. When significant amounts of both storage and conventional regulation are present, the AGC has to be able to use both effectively considering the relative performance characteristics of each. The development of an algorithm to accomplish this was the subject of Task 8.

It was observed during major ramping activity that the storage system failed to respond fully to the ramp even though the power capacity of the system should have been adequate. This is because the AGC relies primarily on a *proportional* where the control signal sent out (regulation) is proportional, i.e. linearly related, to the error signal (ACE). Some AGCs use an integral term as well in order to ensure that ACE returns to zero frequently; it is not known if the California ISO AGC has this feature (although some older documentation indicates not). The project therefore explored different control schemes for using the storage, including the use of a PID controller. Different control schemes were explored and different tunings used until an acceptable scheme was found.

### 2.9. Task 9. Identify the Relative Benefits of Different Amounts of Storage

After developing an algorithm to properly control the storage devices, researchers examined the benefits of various capacities and durations of storage. In particular, researchers calculated system metrics for varying amounts and durations of storage to see the maximum amounts necessary to return to today's performance levels.

The ultimate objective of using storage for regulation and ramping may have to be determined in light of several different metrics:

- Maximum frequency deviation (a reliability criterion)
- Maximum ACE (a NERC criterion)
- Maximum interchange error (which could become a reliability or economic criteria if events result in overloads and/or re-dispatch to avoid prolonged overloads under renewable ramping) or
- Avoiding the need for conventional units scheduled on simply to provide regulation and ramping (economics and emissions).

In other words, ACE excursions of over 1,000 MW may be tolerable if they are restored promptly. This study used as an objective the maintenance of overall performance similar to today and did not explore whether in the future different system performance criteria can be established.

### 2.10. Task 10. Define Requirements for Storage Characteristics

Different storage technologies exhibit different characteristics in terms of the cost of energy storage capacity and the relative cost and performance of rate of charge, and also the charging-discharging losses incurred. These parameters are usually stated as duration, power capacity, and efficiency.

Other storage parameters of interest include efficiency in the charge / discharge cycle, self-discharge, rate limit, and depth of discharge capability. Some technologies cannot withstand frequent deep discharge (traditional lead acid batteries, for instance). Others are more or less *lossy* (prone to energy dissipation) and inefficient. Some have different charge and discharge rates. The storage systems studied had efficiencies of 95 percent, which is the best achievable from advanced lithium-ion systems; where the inverter electronics and step-up transformer consume the 5 percent. Lesser efficiencies do not reduce regulation or ramping performance but adversely affect economics due to losses in the charge-discharge cycle. This was not considered a factor in system performance.

An inability to withstand deep discharge cycles means, in effect, that additional capacity needs to be installed in order to provide effective capacity. Thus, if a technology were deployed that were limited to 50 percent discharge, it would be necessary to provide twice the capacity of a technology of one that had no such limit. Thus, a storage system with a 50 percent limit would in effect need 12,000 MWh of storage where the study had determined that a 3,000 MW, 2-hour unit was required.

The rate limit of the storage system, however, is a performance concern for this study. The *infinite* storage systems and the sizes validated had no rate limit. That is, it was assumed that the power electronics could change from full discharge power to full charge power in less than one second and that the storage media could withstand this. As a practical matter, this performance level is far greater than required. It is not clear to the researchers that the storage industry understands the impact of frequent power level changes at a high rate limit as this is not normally a requirement.

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The rate limit performance requirements were determined by imposing decreasing rate limits on the rate of power input/output of the storage devices until system performance degraded significantly. This allowed the development of a sensitivity curve of system performance versus storage rate limit for the selected sizes of storage systems.

The storage systems first studied with no effective rate limit in effect have storage power output equal to desired power control signal input. Once a rate limit is imposed, the AGC control algorithm controlling the storage has to be adjusted to maintain performance of the overall system. This was assessed by varying the gains of the PID controller (including a derivative term to prevent integral overshoot).

### 2.11. Task 11. Determine Storage Equivalent of a 100 MW Gas Turbine

Researchers examined the best storage configuration that could act in the same way as a 100 MW gas combustion turbine (CT) in terms of levelizing variable wind output. To determine the storage equivalent of a 100 MW CT, a definition of the context of the comparison must be made. Storage is not an equivalent, of course, in terms of energy production. The context of this study is system regulation and ramping for managing high renewables.

Without performing any simulations, it is possible to do a simple analysis. A 100 MW CT is theoretically capable of at most 50 MW of up and 50 MW of down regulation. (In practice, the amount is less as the unit cannot be ramped below a minimum level without shutting it down.) A 100 MW storage system is theoretically capable of 100 MW up and down regulation, twice the regulation capability of the CT unit.<sup>21</sup>

The energy cost of each technology is quite different. If the regulation signal has zero bias or constant offset in a given hour, the CT will have a 50 MWh cost to provide its 50 MW of regulation. The storage system will have an energy cost associated with its losses in charging and discharging plus any parasitic losses, such as internal self-discharge losses. The charging and discharging efficiencies dominate the losses for most storage technologies, ranging from as much as 30 percent (such as with pumped hydro, Compressed Air Energy Storage (CAES), and some batteries) to 5 to 7 percent (such as with advanced Li-ion batteries, where the efficiency of the power electronics and step-up transformer are the source of the bulk of the losses).<sup>22</sup>

<sup>21</sup> This assumes that the storage system has a duration capable of fulfilling the regulation for at least the protocol minimum period of one hour. If the context is a two hour fast ramp, then the storage must fulfill that time constraint.

<sup>22</sup> However, the total losses with storage are not simply the efficiency 7%; they are 7% of the net charging and discharging power, integrated without respect to sign over the hour. Thus, if the device is cycled 10 times in the hour, the losses could be 7% times 10 times the charge / discharge time which is necessarily no greater than 1/10 of an hour. Thus, the losses are at most 7% but could be much less. Under severe ramping conditions the device would be in a constant state of charge or discharge through the hour, and the losses are simply the 7%.

Assuming 10 percent storage losses as an example, the 100 MW storage device will experience 10 MWh of losses compared to the CT energy production of 50 MWh. Looked at one way, this is a net 60 MWh difference in delivered energy as the storage device must be supplied energy from other resources. Depending upon what resources are on-line and at the margin, this could be a CT, a combined cycle gas turbine (CCGT), a nuclear plant, or a hydro plant – or conceivably renewable resources during the storage charging cycle. In an extreme case, if the renewable resource would have to be curtailed without the storage, then there is no net loss.

A second perspective on the equivalency question is to ask what the relative benefits to system performance are of the CT and the storage device. This can be defined in terms of the maximum ACE or the maximum frequency deviation, or the impact on CPS1 or other criteria. The context of the benefits then becomes an issue – what is the total level of regulation relative to the required level for a given degree of renewables penetration and for a given base level of regulation provided by storage versus CTs? Is the storage unit the first 100 MW of storage when the system has insufficient regulation, or is it displacing 100 MW of CT provided regulation? A similar question can be asked with regard to 100 MW of incremental regulation from a CT. In the latter case an additional question arises, the 100 MW of incremental regulation spread across all conventional units on regulation, all CTs on regulation, or just one CT and what the size and ramping capability of that CT?

In terms of providing ramping capability, it is also possible to perform some straightforward analysis. Power electronics based storage with advanced electro-chemistries is virtually instantaneous for regulation purposes. This is faster than regulation needs, so the benefit of the storage is to provide the minimum ramping rate required. If the CT can provide that ramp rate then the two technologies are equivalent. If the CT is capable of providing only half the ramp rate, then the equivalent storage is only half the CT, assuming adequate storage duration.

During *quiet* periods of renewable production when all that is required is to manage renewable volatility, the performance requirements for storage and conventional units may be modest. Then, the differences between the two technologies are also modest. During periods of high renewable ramping, the dynamic performance differences will be more important.

Finally, the storage device will not incur charging and discharging losses while it is *waiting* for a severe ramp. Stated differently, if in *quiet* periods the storage device only experiences charge-discharge cycles of 5 to 10 percent of its capacity, then the losses are correspondingly less. However, the CT must consume fuel and provide energy if it is *on* waiting on the ramping because a start-up cycle is not acceptable. This energy consumption is not a loss, of course, but must be measured against the cost of the displaced energy at the margin from other units – CCGT, nuclear, or hydro.

Considering all the different perspectives on the question of identifying the storage equivalent of a 100 MW CT, the approach decided on was as follows:

- Produce an analytical comparison of regulation up/down available and ramping available.

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- Define and simulate scenarios where the regulation available is restricted to a representative set of hydroelectric and CT units and matches the maximum regulation utilized by the AGC. Increment the AGC available and the regulation used by an amount equal to half of the capacity of a 100 MW CT, using the closest and highest performance unit in the fleet.
- Compare this to the benefit of adding 100 MW of storage and 50 MW of storage instead of a CT.
- Also compare this to incrementally adding a CT to cases where storage and CTs share the regulation. Add storage similarly.

These cases should provide a comparison of the relative effectiveness of the two technologies.

It would also be possible to compare the effectiveness of adding the 100 MW CT unit with the assumption that it is scheduled *on* at full power awaiting a renewable ramp down and similarly scheduled *on* at minimum power awaiting a renewable ramp up. These results can be extrapolated from the results obtained by the comparisons above.

#### **2.12. Task 12. Identify Policy and Other Issues to Incorporating Large-Scale Storage in California**

Based on the insights gained from the analysis, the researchers worked with the California ISO to develop a list of issues and policies regarding the impact of increased renewables on the system and integration of storage. The purpose of this task was to provide guidance for future policy decisions and future research and analysis efforts.

The policy questions revolve around the market products and protocols available today versus those that might encourage the use of storage. Also considered was the possibility of new interconnection requirements or protocols for renewable resources, plus the tax incentives available to renewable developers and how these relate to storage.

The United States Congress is considering legislation to establish tax incentives for large-scale electricity storage and the issues around how these might impact storage development in California will be discussed as well.

### **3.0 Project Outcomes**

Over 500 simulations were performed across a wide variety of system conditions, future renewable scenarios, regulation levels, and storage configurations. The table below (identical to the one in Section 3.0 with a *findings* column added) summarizes the steps in the project, the types of simulations run, and the findings in each case. Because of the very high number of potential combinations of parameters, only those steps that lead to quantitative results for particular years were performed for all future renewables scenarios; steps such as determining control algorithms and tunings were only performed using representative days.

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Table 4. Outcomes summary

Year / Renewable Scenario	Current	20% RPS	33% RPS Low Estimate	33% RPS High Estimate	Comments	Findings	Year / Renewable Scenario	Current	20% RPS	33% RPS Low Estimate	33% RPS High Estimate	Comments	Findings
<b>Project Study Element</b>							<b>Examining Trade-offs of Storage and Regulation Against Real Time Dispatch Periodicity</b>	N/A	None	None	July Day	Cases with varying combinations of regulation and storage re-run with RTD @ 30 seconds	30 sec RTD only marginally better if that
<b>Calibration</b>	All days plus one June day*	N/A	N/A	N/A	June used a unit trip to calibrate frequency response of system	Model Calibrated	<b>Examining Trade-offs of Storage and Regulation</b>	N/A	None	None	July Day	Sensitivity analyses of incremental 100 MW regulation or 100 MW storage across range of regulation/storage combinations	Storage slightly better - regulation dispersed cross many plants
<b>Determining Impact of Renewables under Current AGC</b>	All days	All days	All days	All days	February, April, July, October	Maximum ACE > 3000 MW in 2020	<b>Examining Trade-offs of Storage and Regulation</b>	N/A	None	None	July Day	Trade-offs were re-examined with the regulation allocation used above for a subset of CT and hydro units	Similar outcomes
<b>Determining Levels of Regulation Required to Accommodate Renewables</b>	N/A	All days	All days	All days	Cases studies with AGC values of 400 - 3,200 MW all cases, and 4,000/4,800 MW where required	3200 - 4800 MW Required variously	<b>Droop Investigations</b>	N/A	None	None	July Day	Droop was doubled on all conventional generators and results studied	Doubling droop not beneficial
<b>Determining Levels of Regulation Required to Accommodate Renewables</b>	N/A	None	None	July Day	Cases with 2,400 - 4,000 MW of regulation were modified to keep all CT's on providing regulation	Some improvement via altered scheduling	<b>Analyzing Storage Equivalent of 100 MW CT - base cases</b>	N/A	None	None	All days	Analyzed for a range of AGC Regulation MW used from 800 to 3,200 using the Regulation Allocation to only a subset of CT and Hydro units	Established consistent base cases for incremental analysis
<b>Determining Levels of Regulation Required to Accommodate Renewables</b>	N/A	None	None	All days	Cases were run with 800-3,200 MW of regulation was allocated to a CT and Hydro subset, matching 3,200 MW regulation level	Results varied numerically but were qualitatively consistent	<b>Analyzing Storage Equivalent of 100 MW CT - base cases</b>	N/A	None	None	All days	Analyzed for a range of AGC Regulation MW used from 800 to 3,200 MW with a 110 MW CT added	30 to 50 MW of Storage Equivalent to 110 MW CT - varies with amount of regulation available
<b>Determining Levels of Storage Required to Accommodate Renewables (Infinite Storage Approach)</b>	N/A	All days	All days	All days	Cases studied with storage levels of 10,000 MW and 12 hr duration	3,000 MW of storage was "sweet spot" except in April	<b>Analyzing Storage Equivalent of 100 MW CT - base cases</b>	N/A	None	None	All days	Analyzed for a range of AGC Regulation MW used from 800 to 3200 MW with 50 and 100 MW storage added	Use of storage can save 3% of emissions
<b>Validating Storage Levels and Determining Durations</b>	N/A	All days	All days	All days	3,000 MW and 4,000 MW cases validated across duration ranges 1 - 4 hrs	Validated 3,000 MW and 2 hours (4,000 MW in April)	<b>Emissions Impacts</b>	N/A	July Day	July Day	July Day	Emissions from CT and CCGT were calculated across various regulation and storage cases	
<b>Developing and Validating Storage Control Algorithm</b>	N/A	None	None	July Day	Many cases run with various schemes and then with all combinations of PID tunings. Selected controls/tuning were used in subsequent cases	PID with anti-windup used for AGC for conventional units and (separately) for storage	*All days refers to the four total sample days. One day in each month of February, April, July and October. Source: model summary						
<b>Determining Storage Rate Limit Requirements</b>	N/A	None	None	July Day	Cases run with storage rate limits varying from 2.5 to 100 MW/second. Resulting 10 MW/sec were used in all subsequent cases	Rate limit > 5 MW/sec required							
<b>Examining Trade-offs of Storage and Regulation</b>	N/A	None	None	All days	Cases with varying combinations of regulation and storage totaling as much as 5,000 MW	Regulation never as effective as storage							

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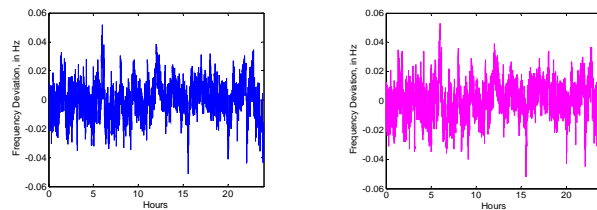
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### 3.1. Simulation Calibration

As described in Section 2.2, to obtain validity in model predictions, the model was calibrated using actual 2008 and 2009 data. The researchers successfully calibrated the power grid dynamics according to historical data. Researchers compared model output to historical data on ACE, frequency deviation, the power spectral density of ACE, the amount of balancing energy required in the real time dispatch, the marginal clearing price in the real time dispatch, and typical unit movement during the day. Graphs of time series data on frequency deviation and ACE from July are used to illustrate results. The appendix provides additional graphs for the remaining days.

#### 3.1.1. Power Grid Dynamics

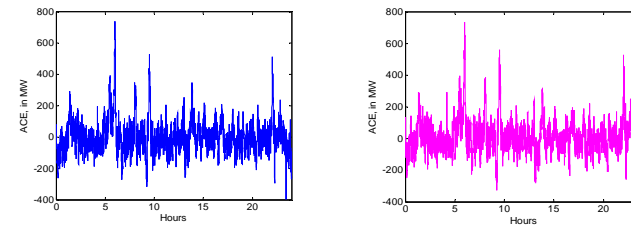
Figure 16 compares the model output with historical data on system frequency deviation for the July base day. The graph on the left illustrates actual frequency deviation and that on the right illustrates modeled frequency deviation. Both the amplitude and shape of the model's estimated frequency deviation match historical values.



**Figure 16. Historical frequency deviation (left) compared to step 1 calibrated model frequency deviation (right)**

Source: California ISO data and model output, respectively

Figure 17 compares historical ACE data for the same date with modeled ACE output. Again, the graph on the left represents the historical data while that on the right represents model output. Both the amplitude and graph shape match between the two, indicating successful calibration of grid dynamics.

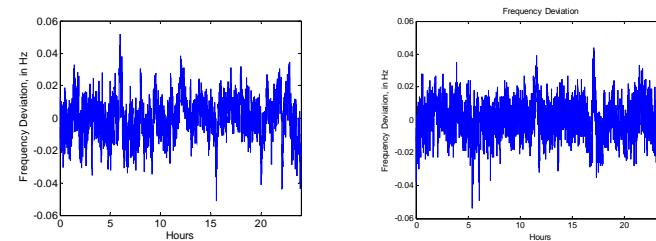


**Figure 17. Historical ACE (left) compared to step 1 calibrated model ACE (right)**

Source: California ISO data and model output, respectively

#### 3.1.2. Primary and Secondary Controls

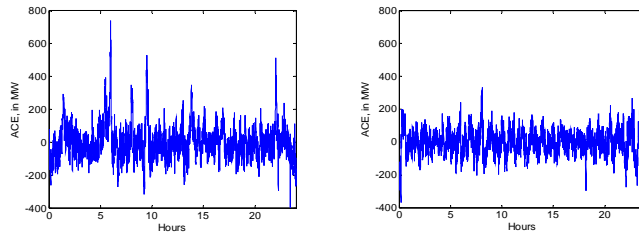
The researchers applied a similar tuning approach to calibrate the performance of the primary and secondary generation controls, including AGC signals. Figure 18 and Figure 19 illustrate the results of this effort for the July sample day. While the amplitudes do not match precisely, the shapes of the curves match closely.



**Figure 18. Historical frequency deviation (left) compared to step 2 calibrated model frequency deviation (right)**

Source: California ISO data and model output, respectively

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**Figure 19. Historical ACE data (left) compared to step 2 calibrated model ACE output (right)**  
Source: California ISO data and model output, respectively

The calibrated simulations are arguably using 4-second load data that is back-calibrated from observations of system frequency and generation as explained above. However, it was deemed infeasible to calibrate the simulated AGC to actual AGC signals sent to generating units. The simulation is *optimistic* in that all units are able to participate in regulation and that when a unit is *instructed* by AGC or real-time dispatch, it responds correctly. Unit delays in response beyond ramp rate limits and unit deviations from schedule are not incorporated in these simulations. Thus, the ATC performance in future renewable scenarios is a *best case* representation of the system ability to accommodate renewables assuming that all conventional units respond correctly and promptly.

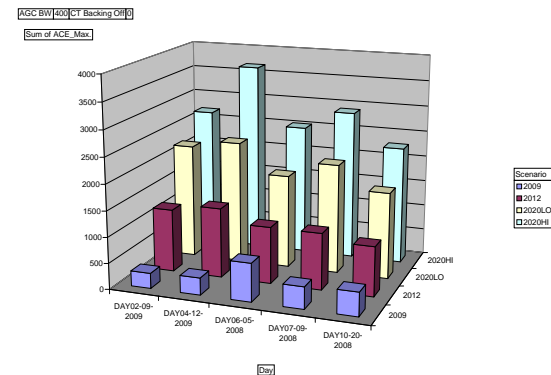
### 3.2. Droop and Ancillary Needs With Current Controls

#### 3.2.1. Introduction

Results from the analysis of additional renewables, assuming current droop settings and regulation amounts (e.g., 400 MW AGC bandwidth) and without any storage facility additions, indicate severe degradation of system performance in 2012 and unmanageable performance in 2020. Without storage, additional regulation resources beyond the current 400 MW of regulation will be necessary.

For all study days, researchers observed increasing degradation of ACE as the share of renewables increased in the generation portfolio. ACE performance was severely degraded in all of the 2012 and 2020 cases, with maximum ACE levels more than doubling and tripling the 2009 levels as shown in Figure 20. With an AGC bandwidth of 400 MW and no storage additions, the maximum observed ACE variation within one day was -600 MW to +1,100 MW for July 2012, and -1,900 MW to over +3,000 MW for July 2020 High. These results were obtained with all conventional units (CT, hydro, and CCGT) on regulation. The CCGT units are actually much slower than the others and are normally not in regulation. Another set of analyses were done with a *realistic* allocation of regulation to the CT and hydro units only, and only in amounts and to as many units as were required to fulfill the AGC regulation requirements. In

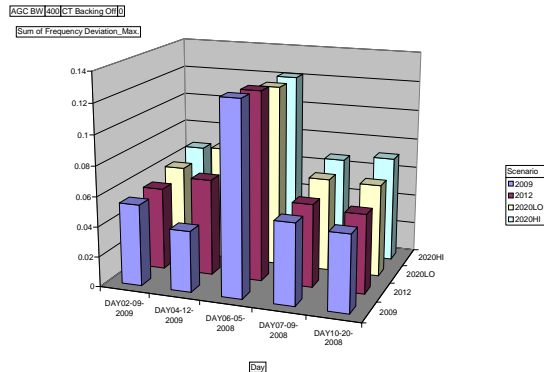
general, these produced better results, even though total unit capacity set aside for regulation was reduced. While the results are improved quantitatively, they are not qualitatively different. This is shown in Figure 20.



**Figure 20. ACE maximum across all scenarios**  
Source: model output

As illustrated in Figure 21, frequency deviation is fairly unchanged across scenarios, varying up to around 0.06 Hz. This is because the bias of the WECC system is such that it takes a very large imbalance to generate a 0.1 Hz deviation.

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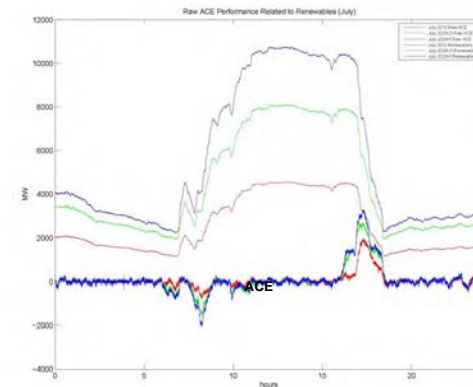
**Figure 21. Maximum frequency deviation across all scenarios**  
Source: model output

While the levels of renewables ramping greatly increase the need for frequency regulation, generator droop does not appear to be a factor in frequency regulation or ramping performance in 2012 or 2020.

The following subsections provide detail on ACE, droop, and balancing energy results, using the July day as an example. Additional results for each of the modeled days are available in the appendix.

### 3.2.2. Area Control Error

Generally, across all days, large ACE deviations occurred twice a day, once in the morning and once in the evening. Degradation in system performance appears to be predominantly caused by renewables ramping in the morning and evening. Renewable variability in the high renewable cases exacerbates the ACE degradation further. Figure 22 illustrates ACE degradation for a July 2012 and 2020 scenarios, alongside the total hourly renewable production for that day to illustrate. The source of the high ACE was determined not to be the actual rate of change of the renewables as much as issues associated with the interaction of renewable forecasting and scheduling with the scheduling of conventional generation, and how AGC interacts with these. A detailed exposition of this is contained in slide form in the appendix.



**Figure 22. ACE results for July day scenarios**  
Source: model output

The predominant cause of ACE degradation in future years is the ramping of wind down and solar up in the mornings, and vice versa in the evenings. Variability of renewable production in the high renewables cases of 2020 cause additional ACE movement.

Wind production decreases in the morning roughly an hour before solar production increases, depending on the day of the year. As such, there is a large drop in wind production in the morning, followed by a rapid pick up of solar an hour later. This occurs just as load is ramping up. The reverse occurs at the end of the day. Commitment of the combustion turbines and combined-cycle turbines as needed to accommodate the renewable generation greatly restricts the ramping ability of the remaining conventional generation.

### 3.2.3. Droop

Droop does not appear to be a factor in frequency regulation or ramping performance in 2012 or 2020. In particular, doubling the droop settings of the units produces negligible change in system performance. This is illustrated by Figure 23, which depicts system ACE with different amounts of droop, and Figure 24, which depicts system frequency deviation with different amounts of droop.

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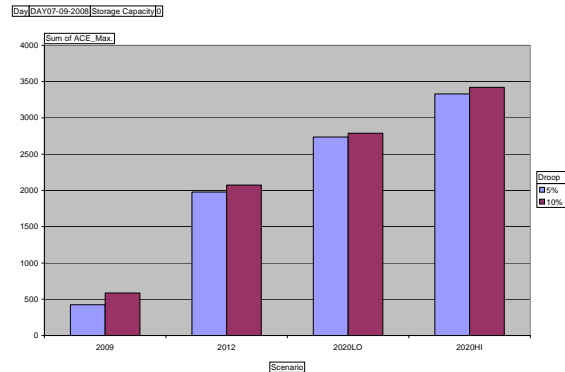


Figure 23. ACE across all scenarios with droop adjustments only  
Source: model output

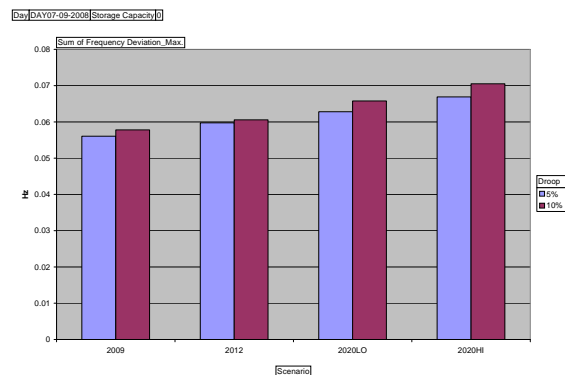


Figure 24. July 2009 frequency deviation across all scenarios with droop adjustments only  
Source: model output

Droop adjustments have little impact on system performance because the ramp rates required to make up for sudden changes in renewable production are beyond what conventional generation can provide. Note that this does not mean that droop should be revisited for conditions where the amount of conventional generation on line is greatly reduced and insufficient system droop is available for a large unit trip. However, the conventional unit droop is sufficient today for evening conditions and light load in the event of a nuclear plant trip and can be reasonably expected to be so in the future.

### 3.3. Assessment of Storage and AGC

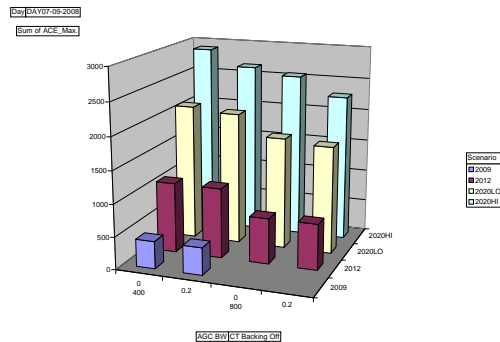
#### 3.3.1. Introduction

The amount of regulation required for AGC to maintain ACE within today's limits was 800 MW in 2012, roughly double today's amount, and 3,200 to 4,800 MW in the 2020 High renewables scenarios, roughly 8 to 12 times today's amount. Infinite storage at first failed to adequately control ACE as expected, using the output of the conventional AGC system. When large-scale storage was configured as a resource similar to conventional generation, providing regulation services results were suboptimal. Using a fast and very large storage system resulted in excellent ACE performance in all scenarios once the storage control algorithms were developed, as described in the following section.

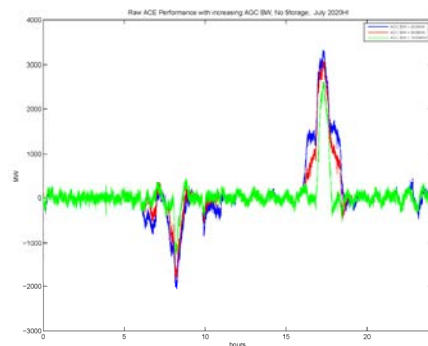
#### 3.3.2. Increased Regulation

The ability of AGC to control renewables volatility and ramping using today's controls and protocols was evaluated. Researchers found that the amount of regulation required for AGC to maintain ACE within today's limits was 3,200 to 4,800 MW in the 2020 High renewables scenario. This was not because of momentary volatility; lesser increases are needed for that. Rather, such amounts were required to address diurnal ramping, especially that of the centralizing thermal solar production. Figure 25 depicts ACE maximums across all July scenarios, and Figure 26 depicts time series data of ACE in the July 2020 High scenario, with different amounts of regulation. Across the scenarios, increased regulation helps return ACE to 2009 values. However, performance remains marginal even at these levels of regulation. Figure 25 below is again with all conventional units on generation. Figure 25 shows the results when a realistic assignment of regulation to units is made.

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**Figure 25. ACE maximums for July day across scenarios with increasing regulation and no storage**  
Source: model output

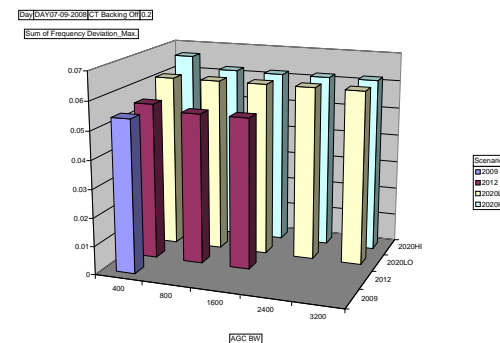


**Figure 26. ACE performance for July 2020 High scenario with increasing regulation and no storage**  
Source: model output

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Analysis of the 2020 High scenario for the July day show that 3,200 MW of regulation is needed to accommodate the renewable evening ramping. Still more is required to maintain ACE at nominal levels. Researchers found that April 2020 would require in excess of 4,000 MW of regulation. Even then, the performance is marginal.

Figure 27 illustrates the frequency deviation for the July 2020 High scenario with different amounts of regulation. As expected, the change in frequency deviation across scenarios is fairly minor.



**Figure 27. Frequency deviation maximum with increasing regulation and no storage, for July 2020 High scenario**  
Source: model output

The researchers and the California ISO observed that procuring this much regulation from conventional units when renewable production was quite high posed problems in and of itself. Renewable production in these scenarios peaks at 10,000 MW or more, well in excess of 20 percent of generation required. If the conventional units are scheduled strictly on an economic basis, the CTs will be the first units to be displaced by the renewables. Hydroelectric and nuclear generation will generally be the last to be displaced. CTs normally provide a significant amount of the regulation capacity in the system. CCT units generally have much lower maximum ramp rates and cannot provide the same regulation service as combustion turbines. As noted above, the generation schedules were constrained to maintain combustion turbines *on* during the day and available for regulation service so that these very high levels of regulation could be realistically provided.

Aside from the ramping phenomena, the renewables cause increased volatility during *normal* operation. This was observed to result in increased ACE and degraded performance, but nearly to the same degree as the ramping phenomena. Accordingly, it was investigated how much

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additional regulation would be required to maintain system performance during the hours 10 AM to 6 PM – i.e., between ramps. The results of this are shown in Table 5. It can be seen that if ACE maximum should be maintained below 500 MW and CPS1 above 180, for example, increased regulation will be needed in 2012 and 2020. As a general observation, it seems that in 2012 800 MW or more is required and in 2020 as much as 1,600 MW.

Table 5. System impact of additional regulation amounts

Scenario	Regulation	Worst max ACE	Worst frequency deviation	Worst CPS1
2012	400	477	0.0470	184
	800	325	0.0425	195
	1,600	316	0.0424	196
2020 Low	400	690	0.063	173
	800	480	0.061	190
	1,600	480	0.061	194
	2,400	480	0.061	194
2020 High	400	950	0.062	141
	800	662	0.061	172
	1,600	480	0.061	191
	2,400	382	0.061	191
	3,200	382	0.061	191

Source: model outputs

Figure 28 illustrates how CPS1 varies across scenarios for each day analyzed.

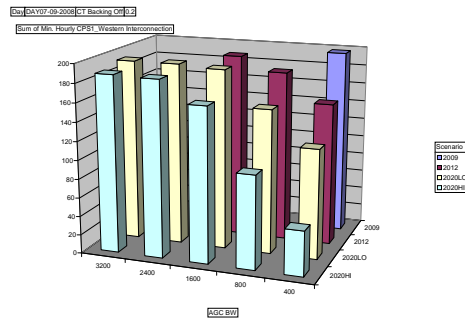


Figure 28. CPS1 minimum with increasing regulation and no storage, for July 2020 High scenario

Source: model output

### 3.3.3. Infinite Storage

When large-scale storage was configured as a resource similar to conventional generation providing regulation services results were suboptimal. The conventional AGC had primarily proportional control with limited integral gains in the control algorithm. This is because in the California ISO area, the AGC is not the primary mechanism for following ramping; the real time dispatch is. As a result, the AGC typically has to deal with relatively small fluctuations (at 400 MW of regulation procured, the California ISO AGC regulation bandwidth is 1 to 2 percent of system load or less). A ramp of 20 to 25 percent greatly exceeds AGC ability to respond. The proportional control algorithm will mathematically allow a constant offset of the error signal. In fact, with the necessary AGC gain of unity, the offset is about half the error before the large storage resource is employed. In other words, using storage as a conventional AGC resource provides only a 50 percent improvement in performance. This was seen consistently across scenarios and seasons. Figure 29 illustrates the ACE improvement provided by storage, for the July 2020 High scenario.

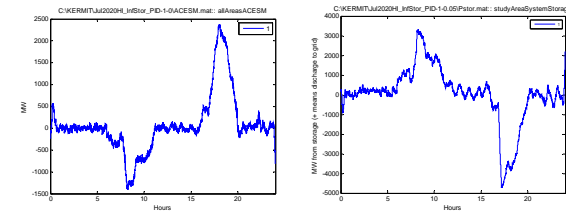


Figure 29. ACE results with storage and existing controls (left) compared to storage output, for July 2020 High Scenario

Source: model output

A Type-1 controller is required instead of a type-0 controller. However, the very different response characteristics of storage versus conventional generation militate against sharing the same control algorithm in a Type-1 mode. The conventional generators overall are slower than the storage and would not be stable with as aggressive an integral gain as the storage system will be. Also, the amounts of storage employed versus conventional generation will be different.

Thus, a separate PID control algorithm controlling storage as a resource separate from the conventional generators was developed and tested. This was found to successfully control ACE within tight bounds when sufficient storage was deployed.

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3.4. AGC Algorithm for Storage

The dramatic impact of the PID control algorithm on ACE performance for different RPS scenarios, compared to the baseline without storage, is shown by Figure 30. ACE variation falls within a tight band while storage *absorbs* the volatility.

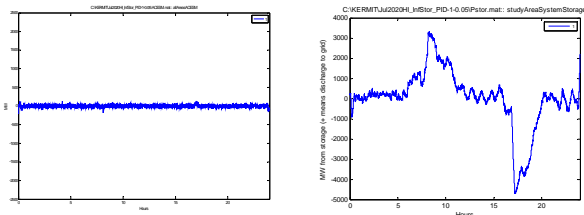


Figure 30. ACE performance with infinite storage (left) compared to storage output (right)  
Source: model output

Furthermore, as shown above, this control algorithm required less than 4,000 MW of fast-acting storage capacity. These results clearly demonstrated that the PID control algorithm, in parallel with conventional AGC response, was an effective strategy for mitigating frequency performance concerns in the 2012 and 2020 RPS scenarios. Figure 31 shows maximum ACE with and without storage with revised controls across all scenarios in July. Controlled storage has a significant impact on ACE and a lesser though positive impact on frequency deviation.

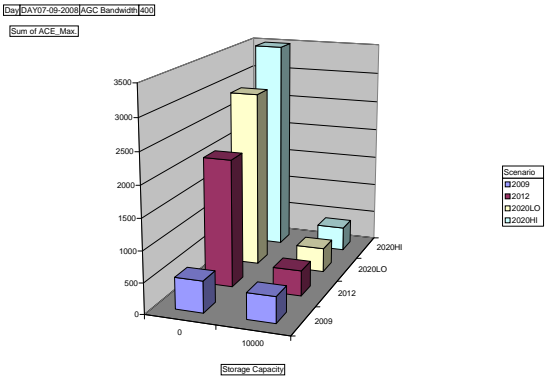


Figure 31. ACE maximums for July day, with No Storage and "Infinite" Storage  
Source: model output

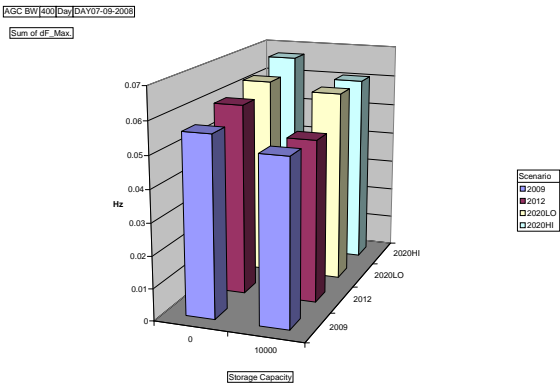


Figure 32. Maximum frequency deviation for July scenarios, with no storage and "infinite" storage  
Source: model output

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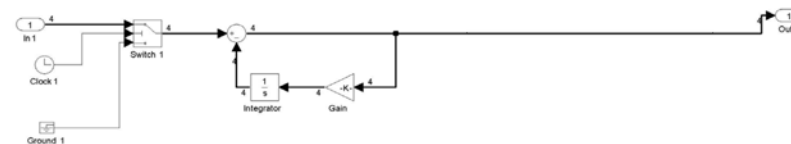
This work was then refined when PID tuning was examined as a function of the rate limit characteristics of the storage system. Exploration was made of altering the AGC algorithm to a similar PID controller. The existing California ISO AGC is believed to be primarily a proportional control system. The simulation includes provisions for PID control; an integral term is desirable to achieve more frequent zero crossings of ACE and reset system ACE to zero. Experiments determined that a derivative term was not necessary. It should be noted that when large amounts of grid-connected storage are available, the demands on conventional units for regulation are reduced, and the purpose of AGC for these units shifts to the real-time dispatch, which becomes the vehicle for tracking renewable ramping.

With both the storage control algorithm and the AGC control algorithm, the introduction of an integral gain term improves normal performance but can greatly degrade performance when the bandwidth of the control system is exceeded. In words, when ACE is greater than 1,000 MW, for instance, and the AGC bandwidth of available regulation is 400 MW, the AGC integral gain will continue to increase well beyond 400 MW, 1,000 MW, or any capacity limit until ACE is restored. This is a well-known phenomenon usually called windup – the correction for this is to impose an integral anti-windup limit on the output of the integral gain. This was implemented, tested, and determined to be effective. It is necessary for both the conventional unit AGC algorithm and the storage control algorithm.

When the storage or the conventional units dominate the regulation MW available, the two separate controllers can be configured as though each was independent of the other. This is valid for the cases assessing how much storage is required to self-regulate or conversely how much regulation is required absent storage. However, when both are present in significant amounts, there is a problem of coordination. Otherwise the system has the potential for over-control if both try to respond, which can degrade ACE performance below what it would otherwise be. This phenomenon was observed in first attempts to coordinate mixtures of storage and conventional regulation to assess the tradeoffs between them.

A first correction to the problem is simple – to allocate the control requirement to the two types of regulation based on the relative amounts each provides at maximum. This methodology solves the coordination problem but is suboptimal in that the faster response of the storage is not fully utilized. This issue was observed and addressed in earlier studies performed for AES and published by KEMA. However, the algorithm developed for that study as noted earlier is not suitable for the ramping phenomena that are a focus of this effort.

Consequently, a further refinement was made to the coordination of the two types of regulation. Conceptually, if the control requirement was a step function, the full step amplitude would be allocated to the storage (This is common with the earlier algorithm.), but the amplitude allocated to the storage is decayed with a simple time constant towards just the storage share. The time constant is chosen to approximate the response rate of the conventional fleet. (Thirty seconds in this case was used. Tuning of this was not further explored once it was satisfactory). The storage control algorithm is shown in Figure 33. A block diagram of the overall control algorithm developed is shown Figure 34.

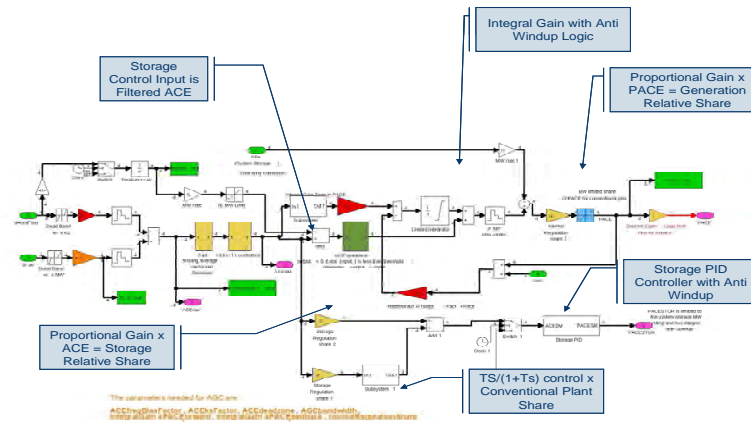


**Figure 33. Storage control algorithm**  
Source: from KEMA model

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**Figure 34. Block diagram of AGC**  
Source: visualization of KEMA model

It was determined that in cases when the storage is insufficient to restore ACE to zero promptly, an anti-windup feature was required. The output of the integral portion of the PID controller was limited to the total storage power available. This prevents the integral gain from *winding up* when the storage is depleted and ACE is not restored. The result of wind up is to have the storage fail to respond in the other direction (restore charge) when it should, and this results in net decreased performance. With an anti-windup installed, consistent good performance is obtained.

The storage systems used in the determination of storage size were modeled as having near-instantaneous response to desired changes in power output. While this is nominally true of modern power electronics, it is not known today if all storage media are capable of supporting these changes frequently at that rate. It is certain that some are not. For instance, CAES will have a rate limit equivalent to a gas turbine. Pumped hydro will have rate limits equivalent to hydroelectric facilities or possibly longer to change from pumping to generating.

The selected storage configurations were tested with rate limits varying from 1,000 MW/second to 2.5 MW/second in logarithmic steps. That is, 1,000, 100, 10, 5, and 2.5 MW/second were used. It was determined that the system performance was practically identical for the instantaneous, 1000, 100, and 10 MW/second limits but that performance degraded when the rate limit was 5 or 2.5 MW/second.

The rate limit of the storage system will alter the total system performance as a function of the PID controller tuning. In particular, slower responding storage will tend to *overshoot* more in response to a large ramp, as the storage may keep increasing power output after the need is past – this is typical of integral control at high gains with rate limited resources. The tuning of the PID controller versus rate limits was explored. The impact of storage rate limit on system performance, and the results of PID tuning versus rate limits are shown in Figure 35 and Figure 36.

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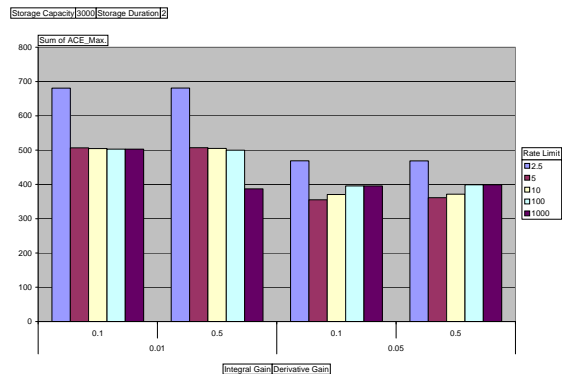


Figure 35. Maximum ACE by storage rate limit for 2020 High scenario, with storage of 3,000 MW and 2 hours and no regulation  
Source: model output

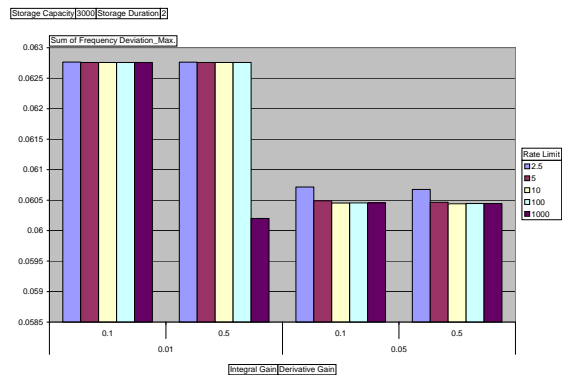


Figure 36. Maximum frequency deviation for July 2020 High scenario  
Source: model output

Analysis results should not be interpreted as definitive guidelines for controller tuning. What it does indicate is that the controller tuning has to be adapted to the storage on-line and its characteristics; it is probably desirable to plan on a scheme that adapts the tuning appropriately. For that matter, the development of a PID controller does not close the topic forever. A type 1 controller will have a steady state offset when following a ramp; it requires a type 2 controller to eliminate this offset. With the high performance storage simulated, the offset was not so great (from observed ACE) so as to require this, and project time/budget/scope did not allow further exploration. But a more sophisticated approach to controller design using root locus techniques may be able to shed further light on the subject. It may also be possible to develop a state-space model and optimal control design. However, as a general comment such an approach will encounter difficulty in obtaining necessary system parameters, and higher-order control designs on this basis are subject to poor performance when the parameters are incorrect. Simpler is better.

3.5. Relative Benefits of Different Amounts of Storage

Figure 37 and Figure 38 show the validation of storage capacities and durations for July. Similar data was produced and analyzed for all days and all renewables scenarios to validate the conclusion that 3,000 MW of fast-acting storage with a two-hour duration achieves solid California ISO frequency performance through the 2020 High RPS scenario, except the April 2020 High scenario which requires 4,000 MW of storage. This is an important finding because the two-hour discharge duration is within the range of current battery technologies. All days were studied but only the July 2020 High Renewables Scenario is shown in the report; other data is in the appendices.

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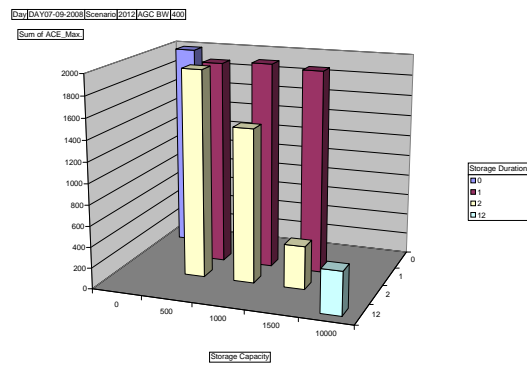


Figure 37. ACE maximum for July 2012 scenario with different amounts of storage at different durations

Source: model output

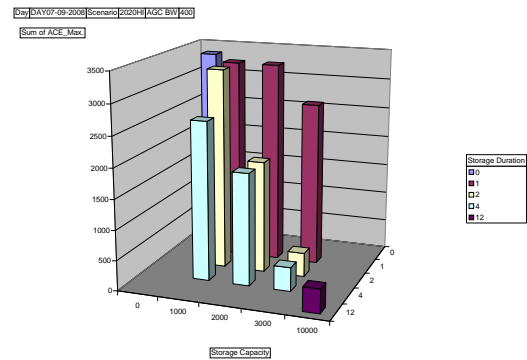


Figure 38. ACE maximum for July 2020 High scenario with different amounts of storage at different durations

Source: model output

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Lower amounts of system storage than *required* to maintain ACE within today's norms will result in good ACE performance during periods when the renewables are not ramping severely but will show degraded ramping performance. This is shown in Figure 39, which illustrates ACE in the July 2020 High scenario with 1,000 MW, 2,000 MW, and 3,000 MW of 2-hour storage and no regulation.

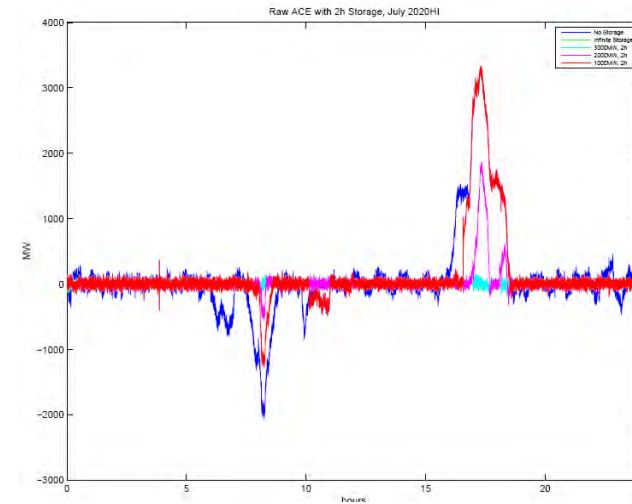


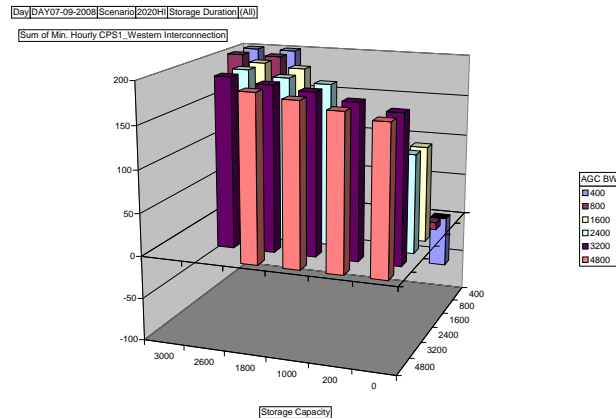
Figure 39. ACE performance with varying amounts of storage for July 2020 High scenario

Source: model output

Another way of measuring system performance is the NERC CPS1 metric. The California ISO has a goal of maintaining a daily CPS1 of 180 or better. Figure 40 shows how CPS1 varies with storage size configured for AGC, in conjunction with differing amounts of regulation procured. The CPS1 statistic, while sensitive to large ACE excursions, is also a measure of general ACE performance. This graph indicates that even with large amount of regulation applied (2,400 MW), 3,000 MW of storage is essential.

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**Figure 40. Minimum CPS1 across different amounts of storage and regulation for July 2020 High scenario**  
Source: model output

This point raises the question of how storage size and increased AGC regulation (or other approaches) relate to each other and work in conjunction. This was addressed at length in Task 3.7 where tradeoffs between storage size and regulation MW (and other parameters) were explored.

During *normal* operations, that is between ramp periods (10 AM to 4 PM) as described above, the regulation required is less, and the storage required is still less. The results of analyses of this aspect are shown in Table 6. As can be seen, storage is more effective than regulation and requires lower increments of storage than of regulation.

**Table 6. Comparison of system performance with regulation and storage**

Scenario	Performance Across Regulation Levels				Storage Added to 400 MW Regulation			
	Regulation amount (MW)	Worst max ACE (MW)	Worst frequency deviation (Hz)	Worst CPS1	Storage amount (MW)	Worst max ACE (MW)	Worst frequency deviation (Hz)	Worst CPS1
2012	400	477	0.0470	184	200	311	0.0438	195
	800	325	0.0425	195				
	1,600	316	0.0424	196				
2020 Low	400	690	0.063	173	400	493	0.0609	190
	800	480	0.061	190				
	1,600	480	0.061	194				
	2,400	480	0.061	194				
2020 High	400	950	0.062	141	1,200	344	0.059	196
	800	662	0.061	172				
	1,600	480	0.061	191				
	2,400	382	0.061	191				
	3,200	382	0.061	191				

Source: model outputs

### 3.6. Requirements for Storage Characteristics

The key parameters for system storage are the power level, the duration or energy capacity, and the rate limit on changes to power output. As described above, these were evaluated, and it was determined that the California ISO control area has maximum benefit from (a) 3,000 MW of storage power capacity with at least (b) a two-hour duration and that the (c) ramping capabilities have to be 10 MW/second or greater.

The 10 MW/second requirement translates to achieving 3,000 MW of output from zero in five minutes. Thus, if there is 3,000 MW of storage with a 5 MW/minute ramp capability (and a 2 hour duration) it would seem that there is a need for faster storage capable of making up the 1,500 MW deficiency that accrues at the end of five minutes – so that 1,500 MW of 10 MW/second storage is required, but with less duration. (Much less; it would need to produce a ramp down over the next five minutes; so that the total energy would be 125 MW hours; e.g. the duration is 125 MWh/1,500 MW or 5 minutes. A similar set of mathematics can be performed for any combinations of technologies with differing rate limits. This implies that a lower capacity cost technology such as CAES can be combined with high performance and higher cost technology such as Li-Ion batteries or super-capacitors.

As a practical matter, it might be better for the storage provider to provide the mix of technologies so as to meet the MW/second requirement as a percent of power capacity and also meet the duration requirement overall. As commented above and visible in Figures 34 – 35, the efficiency of the storage system is not a performance requirement for regulation and ramping requirements but is a cost factor due to the energy losses. The rate limit performance of the

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storage system overall is a critical parameter. As noted above, researchers assessed system performance for differing rate limits on the storage. The storage system must have an aggregate rate limit of at least 5 MW/second for a 3,000 MW aggregate system, and 10 MW/second is preferable. (10 MW/second out of 3,000 MW equates to 0.33 percent/second or 20 percent/minute in general).

### 3.7. Storage Equivalent of a 100 MW Gas Turbine

A key policy question in developing a portfolio of renewable integration solutions is, how does equivalent storage compare to an investment in a new gas turbine for the same service? Storage is more expensive per MW provided, and it has a limited amount of energy it can supply to the system. A gas turbine, on the other hand, can continuously inject energy to system as long as it has a fuel supply. To help assess the question of whether a gas turbine provides more benefits for less money, researchers determined the rough equivalency of storage by examining the incremental impact of a single additional 100 MW CT. In particular, researchers evaluated the system performance impact of 100 MW of incremental CT dedicated to regulation and load following and compared that with the incremental impact of storage systems of different sizes.

Earlier attempts in the project to establish an equivalence between an incremental 100 MW of storage and an incremental 100 MW of regulation had produced some interesting results but were not the same as a direct equivalent to a single unit. This is because incremental regulation is spread across all units on regulation – in the modeled cases, this included all hydro and all CTs. Thus, each unit contributes very little, and unit ramp rate limits will come into play only in the most extreme ramping conditions, not during normal operations.

It was necessary for this comparison to be assured that the additional regulation signal enabled by the incremental turbine would be allocated to that turbine, and to use less *optimistic* allocation of regulation to the units. Therefore, an allocation of *regulation available* was made to the hydro and CT units such that CT units were providing about two-thirds of the total. The hydro units each had 18 MW of regulation assigned, and the CTs each had 15 percent of capacity. Only the larger CTs were allocated regulation; the small units of less than 100 MW were not allocated any. The total *available* (which also enforces that reserves will be at least this much) came to 1,000 MW from the hydro units and 2,500 MW from CTs.

A set of *baseline cases* for July and April 2020 were run where the amounts of AGC regulation used were 800 MW, 1,600 MW, 2,400 MW, and 3,200 MW. It should be noted that in the July scenario 3,200 MW of regulation is almost *enough* to bring maximum ACE to current levels (610 MW max versus less than 400 MW normally). However, that amount in April was insufficient.

Then one CT with a capacity of 110 MW with 50 percent of capacity allocated to regulation was added to the mix. This CT had a very high rate limit – 120 percent of capacity in 5 minutes. (The large CT units (over 500 MW) are significantly slower. The very small units are this fast or faster). The *baseline cases* were rerun with this CT added, and the improvement in various metrics (maximum ACE, maximum frequency deviation, and minimum CPS1) were noted.

Then, instead of the CT, storage units of 50 and 100 MW were added to the model, and the test cases were repeated. Again, this was run twice. As expected, the 50 MW storage unit produced benefits similar to the CT in some cases and varied in others. The 100 MW unit exceeded the metrics improvement of the CT by far. The three data points (two for storage, one for CT) were used to linearly extrapolate the size of a storage unit that provided numerically similar benefits to the CT.

Figure 41 illustrates that the equivalent size storage unit varied from approximately 30 MW to 50 MW. That is, on this incremental basis *a storage unit is two to three times as effective as an incremental CT*. The July day shows greater benefits probably because the system is more manageable on that day. On the April day, the ranges of regulation available are seriously insufficient, and the rate limit capabilities of the storage are not as important as the total MW – thus the ratio of storage to CT approaches the 50 to 100 ratio due to the ability of the storage to both inject and draw power.

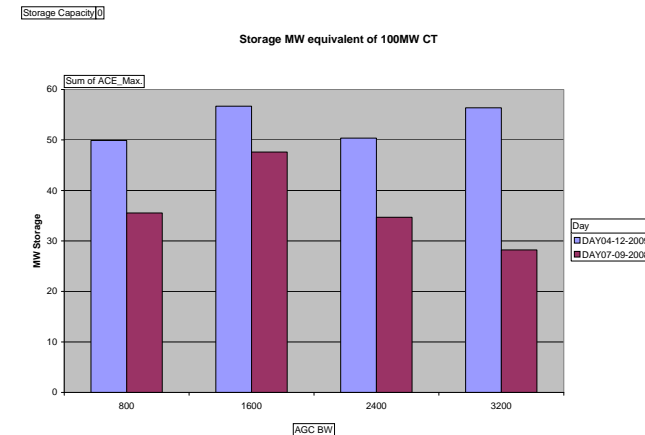


Figure 41. Comparison of storage to a 100 MW CT

Source: model output.

The ratio of storage to CT is extremely non-linear. At the extremes, when there is already 3,000 MW of storage in use for example, the incremental benefit of either approaches zero. Thus, a range of conditions was used to establish this metric.

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### 3.8. Issues With Incorporating Large Scale Storage in California

The results of this report indicate that renewable ramping creates volatility in the system and that storage has the technical potential to help address this volatility. However, key policy questions are how to best promote various ramping solutions and how to account for tradeoffs among them. Imposing ramping limits on renewable resources as an interconnection requirement would address volatility and leave open the question of which solution to use (storage, combustion turbine, or other means). Resource ramping limits are feasible for the *ramp up* phenomena (at some lost energy production), but not for the *ramp down*, which is technically difficult (requires storage in some form either at the resource or at the system level). Requirements could promote self-provided ramping management or might allow procurement from other resources or the California ISO markets. However, compared to other solutions, storage appears to have benefits and may be preferred in some instances.

Without storage, CT ramping would need to increase. This has three basic impacts:

- Increased maintenance costs and reduced lifetime from additional wear and tear
- Postponed de-commitment of CT units
- Increased GHG emissions

Storage could absorb the volatility and limit CT ramping, diminishing these adverse impacts. Though storage units are more expensive than CTs, the avoided emissions and wear and tear may make the incremental cost worthwhile. Additional research needed to assess additional CT maintenance costs and to value emissions reductions. Figure 42 and Figure 43 show the benefits storage has for both CT and hydro generators in terms of reduced ramping in response to renewables. As the amount of storage increases, the amount of unit ramping decreases.

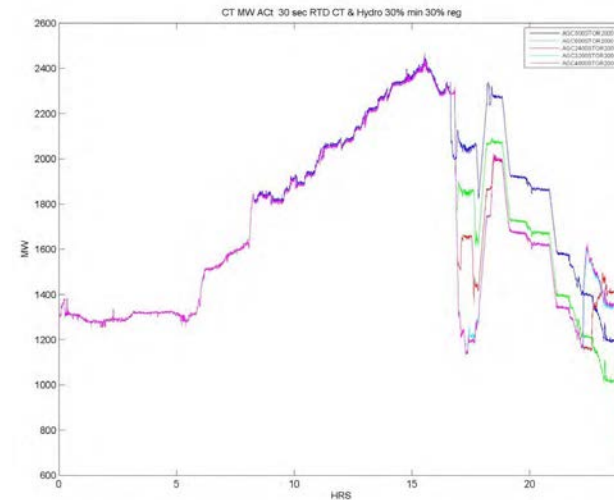
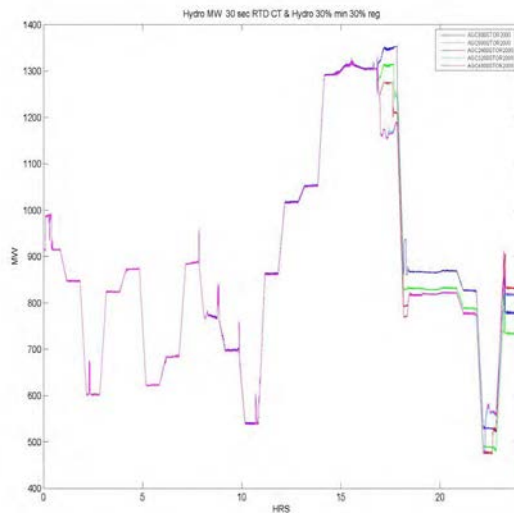


Figure 42. CT output at different levels of regulation  
Source: model output

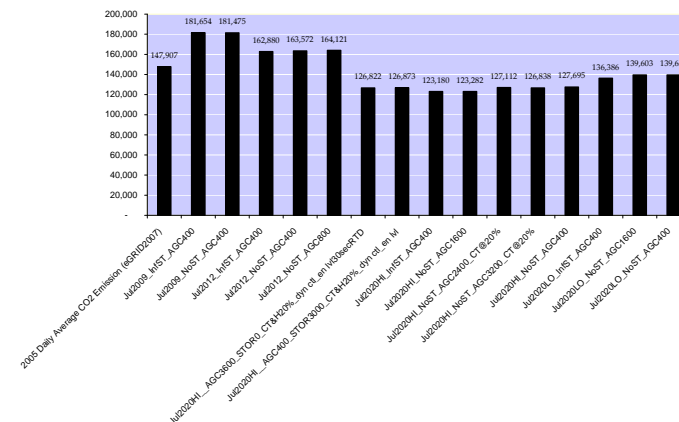
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**Figure 43. Hydropower output at different levels of regulation**  
Source: model output

Excessive ramping up and down of hydro units has environmental implications for downstream water levels and may even be impractical in extreme cases.

Keeping the CT units on in order to provide regulation has an emissions impact. This is shown in Figure 44.



**Figure 44. CO2 emissions in U.S. tons, by scenario**  
Source: model output

The most meaningful comparison of these many cases is the comparison between the no storage AGC 3,200 MW case in 2020 and the Infinite Storage case for that year. This shows that greenhouse gas emissions increase approximately 3 percent for that day – as a result of the forced dispatch of the combustion turbines to provide regulation in the first case.

The acquisition of regulation and ramping services from storage in the amounts identified will be a significant cost to the system. How these costs will be allocated – either to the entire market as an ancillary service or to renewable resources in effect by imposition of ramping rate limits has profound economic implications for renewable developers and the future economic viability of renewable resources.

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### 4.0 Conclusions and Recommendations

#### 4.1. Conclusions

There are five major conclusions from this research work:

- The California ISO control area will require between 3,000 and 4,000 MW of regulation / ramping services from "fast" resources in the scenario of 33 percent renewable penetration in 2020 that was studied. The large ramping requirement is driven by the combination of solar generation and wind generation variability that is forecasted for the 33% scenario. Some of this ramping requirement can be satisfied by altering the likely system commitment for conventional generation to maintain a large amount of gas fired combustion turbines on-line available for ramping. It also may be possible to alter the scheduling of hydroelectric facilities and pump-storage facilities so as to assure adequate ramping potential at critical periods, although there are environmental and operational difficulties associated with this.
- The moment by moment volatility of renewable resources will require additional AGC regulation services in amounts (up to doubling today's levels) that can be reasonably procured.
- The ramping requirements twice a day or more require much more response and will be the major operational challenge.
- Fast storage (capable of 5 MW/second in aggregate) is more effective than conventional generation in meeting this need and carries no emissions penalties and limited energy cost penalties.
- Use of storage also avoids greenhouse gas emissions increases associated with scheduling combustion turbines "on" strictly for regulation and ramping duty.

An alternative to providing large-scale fast system ramping is to constrain the ramp rates of wind farms and central thermal solar plants so as to reduce the need for system ramping resources. This is an interconnection requirement in some island systems today. Meeting ramp rate limits on *up* ramping is easy enough to do at some lost energy production; meeting down ramp requirements is more technically difficult.

Storage at the site of the renewable resources or as a market service that renewable producers can acquire is an alternative to a system ancillary service with identical benefits and results. There are a number of policy issues at the state and federal level around this concept today which are elaborated in the report. The most important is to determine if ramping restrictions and support are the financial responsibility of the renewables operator or the market; and related to that what storage investments will qualify for what investment tax credits and how these are linked to renewables facilitating increased renewable generation.

The study identified some successful control algorithms and protocols to use for system storage resources for regulation and ramping. These can be evaluated by the California ISO for implementation if system storage is pursued as an ancillary service resource. This is not to say that these algorithms are definitively the optimum that may be developed; future R&D on advanced control strategies linked to wind and solar power forecasting is still very much worthwhile. Nevertheless, these algorithms imply that it is certainly worthwhile for the California ISO to explore implementing a new market product for fast storage services for regulation and load following.

The study examined the benefit of changing the periodicity of the real time dispatch function from 5 minutes to 30 seconds. This did not provide the benefits anticipated due the very high ramp rates experienced in the evening when central thermal solar ramps down very rapidly. Altering the droop settings of conventional generators was of no benefit to system regulation or ramping. A separate effort to assess the need for altered droop settings as a result of decreased conventional generation on-line may be in order, along with a study of system transient response due to lowered inertia. Neither of these is regulation or load-following effects.

The accommodation of 33 percent renewable generation resources is the goal established by the Governor for the state. To achieve this goal will require major alterations in system scheduling and operations under current paradigms, which will be costly in terms of energy costs and GHG emissions. The use of storage in conjunction with new control and ramping strategies offers a way to avoid these costs and provide current levels of system reliability and performance at lower risk. While it is yet to be investigated, storage also promises to be a useful tool in making use of DR as an additional ancillary service provider to facilitate renewable integration.

The 3,000 to 4,000 MW of storage which could be used to address renewables management requires a ramp rate capacity of 5 to 10 MW/second, or 0 to full power charging / discharging in 5 minutes. This equals or exceeds the ramping capabilities of most conventional generating units, and particularly the larger combustion turbines. Smaller combustion turbines in the California ISO database can meet this ramp rate requirement, but there are insufficient quantities of such units to provide the required 3,000 to 4,000 MW of fast ramping. Hydroelectric units are capable of changing output levels at these rates. However, it is unclear if the hydroelectric units have sufficient range available for regulation at these levels without having to operate in hydraulic forbidden zones. The hydro units also have very limited amount of water available in the fall and winter months, so they are not available as a regulation resource during a number of months. A parallel 33 percent renewables study is investigating the scheduling and dispatch implications of providing sufficient ramping and reserved requirements, and its results should be integrated with the results of this study for further analysis.

A duration of two hours for the storage systems was found to be sufficient for the regulation, ramping and load following applications.

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The measurement of the relative effectiveness of storage to a combustion turbine demonstrates that, depending upon system conditions and other factors, a 30 to 50 MW storage device is as effective as a 100 MW CT used for regulation and ramping purposes. This is an incremental figure measured across a range of system scenarios; that relative performance figure of merit would not obtain across the entire range of regulation resources 0 – 5,000 MW of course.

#### 4.2. Recommendations

This section outlines recommendations resulting from the analysis described above. The research team recommendations fall into two categories: additional research growing out of this study and policy issues.

##### 4.2.1. Recommendations on Additional Research

Table 7 summarizes additional research recommended by the project team. The following text describes this in detail.

**Table 7. Additional research recommendations by project team**

Research Recommendation	Rationale
Add additional days to the sample	Obtain results that reflect a larger sample of days to understand the statistical behavior and extremes in renewable volatility and ramping.
Examine geographic and temporal diversity of renewables	Understand the statistical behavior and extremes in renewable volatility and ramping.
Assess the impact of external renewables	<ul style="list-style-type: none"> <li>- The analysis made no assumption about external renewables or behavior.</li> <li>- The characteristic of renewable imports may impact frequency deviation.</li> </ul>
Develop dynamic models for CS plants including gas co-firing, thermal storage, and electrical storage possibilities	<ul style="list-style-type: none"> <li>- CS ramping was identified as a major challenge. Understanding how it may be managed is central to understanding the tradeoffs involved in addressing ramping.</li> </ul>
Develop dynamic models for other types of solar plants including Sterling Engines and Large PV installations.	<ul style="list-style-type: none"> <li>- New types of solar plants will have different ramp up and down characteristics and operating characteristics. These models should be included in the build out scenarios for 33 percent renewables.</li> </ul>
Validate ancillary service protocols for storage	<ul style="list-style-type: none"> <li>- Future R&amp;D on advanced control strategies linked to wind and solar power forecasting is worthwhile.</li> <li>- This will affect the R&amp;D and engineering directions taken by the grid storage industry.</li> </ul>
Assess the market implications of procuring very high levels of regulation/reserves as may be required	Changes to market protocols may be advisable.
Continue Development of the California ISO AGC algorithms for Storage and real-time demand response.	The algorithm developed considers a single aggregated storage resource. At a minimum, a simple algorithm to allocate regulation/load following to individual resources using that signal, and to update the status of each individual resource (energy level) into that algorithm, is required.

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Research Recommendation	Rationale
Conduct a cost analysis for solution alternatives.	This report looked at the technical potential of storage only. Cost considerations will weigh into how to balance different options.
Examine the use of DR as an additional ancillary service to facilitate renewable integration, and potentially the use of storage.	<ul style="list-style-type: none"> <li>- It is not yet apparent that DR programs could provide the high-speed response required to manage renewable ramping that grid connected storage can. If it turns out that the benefits of rapidly responding DR are important in making DR useful for accommodating renewables, then that knowledge will be important in the design of smart grid capabilities for DR and the associated protocols.</li> </ul>
Conduct a WECC-wide study and include the impact of the proposed changes to the NERC BAL standards and the potential approval of a Frequency Response Requirement (FRR) for WECC Balancing Areas.	<ul style="list-style-type: none"> <li>- It may be that NERC will have to re-examine CPS criteria in light of high renewables levels and establish new goals appropriate to the interconnections and the anticipated geographic diversity of renewables as well as what frequency deviation and tie deviation the interconnection can tolerate.</li> <li>- This research maintained control area performance at today's levels.</li> <li>- What realistic limitations on system performance (ACE, frequency deviation, NERC CPS) should be considered in developing protocols and needs for storage and renewables balancing.</li> </ul>

Source: Authors

The study did not examine the potential to use DR as an ancillary service associated with the ramping phenomenon as another means of mitigating the impact of renewables. While it seems intuitively obvious that DR could provide similar benefits as storage, it is not apparent that DR programs can meet all the requirements of the ISO to provide the high-speed response required to manage renewable ramping similar to grid-connected storage. A second phase to this study is recommended to investigate DR in conjunction with storage and to examine the response rate potential of DR under different smart grid strategies. If it turns out that the benefits of rapidly responding DR are important in making DR useful for accommodating renewables, then that knowledge will be important in the design of smart grid capabilities for verifying the DR response. It should be noted that the greatest need for DR occurs at times of the day when economic and domestic activities are themselves *ramping up* and that achieving the needed levels and responsiveness of DR may be challenging. This is not DR for peak shaving to reduce peak energy prices but is DR for ramping mitigation with different time frames and ISO performance requirements.

The acquisition of regulation and ramping services from storage in the amounts identified will be a significant cost to the system. How these costs will be allocated – either to the entire market as an ancillary service, or to renewable resources in effect by imposition of ramping rate limits, has profound economic implications for renewable developers and the future economic viability of the renewable resources. Development of the business and regulatory models for this problem are not part of this study but need to be examined so that an informed policy

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debate can take place. The development of the ancillary service protocols for storage will definitely affect the R&D and engineering directions taken by the grid storage industry and need to be validated and made known as soon as practical. For instance, the two-hour duration requirement is a significant parameter that will affect which storage technologies are *in play* or not. Similarly, the ramp rate requirements for grid storage in this application will have implications for the technologies developed and deployed. A careful study of the implications of acquiring very large amounts of regulation / reserves / load following via the market is in order. A careful analysis of how deep the regulation market is and whether units capable of fast regulation should be treated as having market power may also be in order.

The California ISO is considering changes to the market and the energy management system to integrate several hundred MWs of limited energy storage resources such as flywheels and batteries in the regulation market. These devices typically have very fast response rates and can switch between charge and discharge modes within 1 second. They also have very limited amount of energy storage capability, typically 15 minutes of energy, and therefore require constant monitoring to ensure they can continue to provide their full regulation range and are energy-neutral over a 10 to 15 minute period. The proposed AGC dispatch algorithm changes should also include models for these devices and include an energy replacement control loop.

There are a number of secondary results from the study – investigation of control algorithms for instance, which also need to be subject to broad industry review and validation and then developed appropriately by the California ISO for implementation. Where appropriate, market products have to be designed and tariffs filed.

The study was *optimistic* in one critical way – the impact of large forecast errors for renewable production, especially forecast errors associated with wind production, was not studied. The wind forecast errors assumed in the scheduling and dispatch were as actually observed on the studied days in 2008-2009 and were not significant. Addressing larger wind power forecast error problems will further emphasize the benefits of storage as compared to conventional generation used for regulation as these units would have to be kept on for longer periods in order to provide against forecast error.

The study observed wind, PV, and CS production for simulated days across the seasons and then scaled these up for the 2012 and 2020 renewable scenarios. This methodology was the only practical approach in the time frame with the data available to the California ISO. As such, it tends to reduce the impact of geographic diversity on the renewable ramping characteristics. While data across the West Coast seems to indicate that this geographic diversity is not as large a factor as might be thought, it will be an important point of discussion with the renewable community and needs further analysis. The California ISO is conducting an analysis of the correlations of wind power geographically today. The results of this could be used in another phase of this project that examines most or all of the days in a year so as to understand the statistics of system ramping requirements. Note that the system has to be able to withstand the expected worst case scenario for coincident ramping seasonally – it cannot be designed and operated for *averages* if there are significant probabilities of reliability-threatening coincident ramping.

Literally hundreds of second-by-second simulation of the California power system were performed for each of the four days and four renewable scenarios developed. These simulations produced the conclusions and results described above. The conclusions and recommended control algorithms and dispatch protocols need to be validated across a much larger sample of days than the four seasonal typical weekdays chosen.

The California ISO did not have available projected hourly schedules for the conventional generation against the different renewable scenarios nor could those have been practically adapted to various reserve and regulation levels studied were they available. As the projected hourly schedules for conventional units become available, these can be iteratively combined with the hypothetical storage and renewable ramping solutions to further validate and refine both the production costing and dynamic performance conclusions. The limited investigations that the project made of this topic showed that system performance varies with the allocation of regulation to conventional units in ways that vary from one day to the next, not always intuitively apparent. The interaction of energy scheduling, reserve and regulation allocation, and system performance when very high levels of regulation are procured is extremely complex.

The study used assumptions by the California ISO about how much of the state wind power would actually be purchased from wind developers located within the Bonneville Power Administration control area and how much of those resources would be *levelized and balanced* by BPA versus the California ISO. These assumptions will greatly affect outcomes and thus need to be monitored and adjusted as contracts are negotiated. Related to this is the conclusion in the study that the WECC system frequency is not at risk as much as the California ISO ACE, due to the size of the interconnection. However, if significant additional renewable resource penetration is assumed across the WECC, this result will be optimistic. Therefore, the extension of the study to broader WECC issues (where geographic diversity will have a larger favorable impact) is probably a topic for discussion between the California ISO and WECC.

Finally, the study scope did not include examination of the costs of either greatly increasing procurement of ancillary services or of deploying large amounts of grid connected storage. Such a cost benefit tradeoff requires forward projection of these costs, which is somewhat speculative. These cost benefit tradeoffs can be developed for hypothetical future developments on the economics (including carbon cap and trade) of conventional generation and of storage technologies. A commitment by the state to a single strategy using today's economics will not be as wise as a continuous adoption of strategies as costs and technologies evolve.

This research maintained control area performance at today's levels. It may be that NERC will have to reexamine CPS criteria in light of higher penetration of renewables and establish new goals appropriate to the interconnections and the anticipated geographic diversity of renewables as well as what frequency deviation and tie deviation the interconnection can tolerate. Towards this purpose, a WECC-wide study similar to this one is an advisable next step.

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**4.2.2. Policy Recommendations**

There are three major policy recommendations that should be considered as a result of this study and several secondary issues are raised.

First, the likely resolution of how to manage the operational challenges of renewables will have four elements:

- Imposition of ramp rate limits on renewable resources on some basis.
- Utilization of fast storage for regulation and ramping either as a system resource or as a resource utilized by renewables resource operators.
- Procurement of increased regulation and reserves by the California ISO.
- Utilization of DR as a ramping / load following resource, not just a resource for hourly energy in the day-ahead market.

This study primarily investigated the first two of them. Follow-on efforts are recommended to study the effectiveness of ramp limits on renewables and the effectiveness of DR for load following are required before firm policy decisions can be taken. Also, introducing the need for these latter two elements will stimulate the market debate among parties affected. While the study does not offer research to support this assertion, it seems that ramp limiting renewables, if feasible, will be a key element.

Second, the use of fast storage as a system resource for renewables management appears to require technical performance characteristics of the storage, in particular ramp rate limits. If these are to be imposed as requirements for a new regulation ancillary service then the storage development community needs to be aware before large investments are made in technologies that are not capable of this performance.

Secondary policy issues are:

- Will storage be a resource tied to renewable installations; available as a merchant function in the market available to the renewable operator, or available only to the California ISO as an ancillary service provider? This question is linked to the question of whether to ramp limit renewables.
- As indicated by this study, procurement of very large amounts of regulation and reserves from conventional units may cause market distortions. If so, new market and regulatory protocols may be required.
- What incentives at the federal or state level are indicated to support storage resource development? And how should these be linked to renewable facilitation? It seems that storage should meet the technical performance characteristics identified in this report as validated and amended by the California ISO in order to qualify. The state may wish to communicate this concept to the U.S. Congress which is contemplating investment tax credits for storage.

- This study used existing California ISO system performance criteria as the benchmark and developed regulation and load following requirements on the assumption that any significant degradation of these is unacceptable. However, NERC and/or WECC may establish new performance criteria developed with high RPS operations in mind.

Third, the Energy Commission should fund additional research on new energy storage technologies that can be integrated with large concentrated solar and PV installations. The goal is to reduce the variability of the solar energy production and to reduce the rapid and large ramp ups in the morning and ramp downs at sunset. Existing molten salt thermal storage is both expensive and operationally challenging. New technologies are needed now before the large solar plants are all designed and built.

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## 5.0 Benefits to California

The prospective benefits to California from the development of fast electric storage resources for use in system regulation and renewable ramping mitigation are significant. Specific benefits of fast storage include:

- Management of large renewable ramping as well as increased minute to minute volatility without degrading system performance and risking interconnection reliability.
- Management of renewable volatility and ramping without having to procure very large amounts of regulation and reserves, which may be either very expensive or infeasible.
- Reduced breakage and maintenance of the thermal and hydro generation fleet as they will be subject to less volatility and stress as the energy storage resources will absorb a lot of the rapid changes in energy production.
- Avoidance of keeping combustion turbines on at minimum or midpoint power levels to support regulation and load following.
  - Avoids increased GHG emissions.
  - Avoids higher energy costs due to combustion turbine energy displacing lower cost CCGT and/or hydroelectric energy.

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## 6.0 References

California Energy Commission. *California Energy Demand 2010-2020 Staff Revised Forecast*. 2009. Available on-line at: <http://www.energy.ca.gov/2009publications/CEC-200-2009-012/>

California Independent System Operator. *Integration of Renewable Resources: Transmission and Operating Issues and Recommendations for Integrating Renewable Resources into the California ISO-controlled Grid*. 2007.

NERC. *NERC Balancing Standards*. Available on-line at: <http://www.nerc.com/page.php?cid=2120>

NERC. "Control Performance Standards." February 2002. Available on-line at: <http://www.nerc.com/docs/oc/ps/tutorcps.PDF>

NERC. "Glossary of Terms Used in Reliability Standards." February 2008. Available on-line at: [http://www.nerc.com/files/Glossary\\_12Feb08.PDF](http://www.nerc.com/files/Glossary_12Feb08.PDF)

OASIS California ISO. 2007. Available online at: <http://oasishis.caiso.com/>

WECC. WECC Reporting Areas. Viewed 2009. Available on-line at: <http://www.ferc.gov/market-oversight/mkt-electric/wecc-subregions.PDF>

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

7.0 Glossary

ACE	Area Control Error
AGC	Automatic Generation Control
CAES	Compressed Air Energy Storage
California ISO	California Independent System Operator
CCGT	Combined-cycle gas turbine
CPS	Control Performance Standard
CPUC	California Public Utilities Commission
CS	Concentrated solar
CT	Combustion turbine
EAP I	<i>Energy Action Plan I</i>
EAP II	<i>Energy Action Plan II</i>
Energy Commission	California Energy Commission
GW	gigawatt
GWh	gigawatt-hour
IOU	investor-owned utility
kW	kilowatt
kWh	kilowatt-hour
MRTU	Market Redesign and Technology Upgrade
MW	megawatt
MWh	megawatt-hour
PIER	Public Interest Energy Research
NERC	North American Electric Reliability Corporation
T&D	transmission and distribution
VAR	volt-ampere reactive
WECC	Western Electricity Coordinating Council

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**8.0 Bibliography**

California Energy Commission. *Implementation of Once-Through Cooling Mitigation Through Energy Infrastructure Planning and Procurement*. 2009.

Yi Zhang and A. A. Chowdhury. *Reliability Assessment of Wind Integration in Operating and Planning of Generation Systems*. 2009.

Clyde Loutan, Taiyou Yong, Sirajul Chowdhury, A. A. Chowdhury and Grant Rosenblum. *Impacts of Integrating Wind Resources Into the California ISO Market Construct*. 2009.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**Appendix A: KERMIT Model Overview**

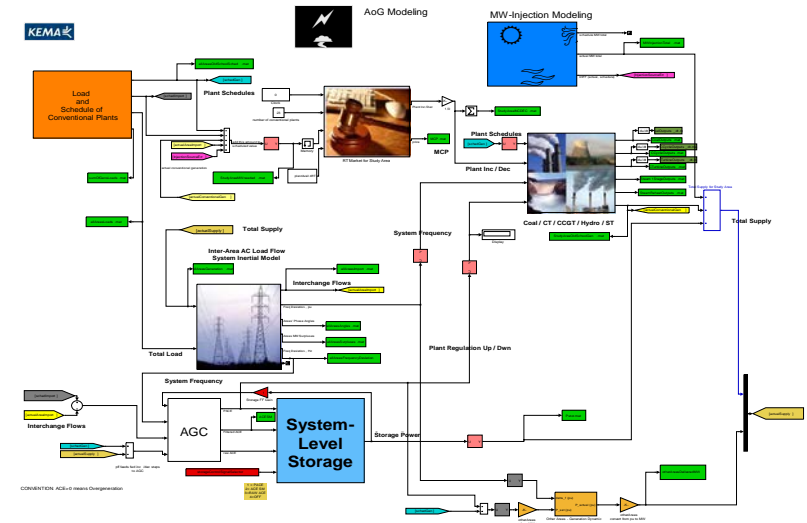
Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Figure APA 1. KERMIT diagram

The key elements of the simulator are shown in and include the following:

- Detailed IEEE standard dynamic models of a variety of generation types – including steam (coal or gas fired), CCGT, CT, hydro, and general distributed generation resources. These models include governor and plant controls, combustion systems and controls, steam and hydraulic effects, and turbine dynamics. The model incorporates wind farms and storage facilities.
- Models of generation company portfolio dispatch and scheduling.
- Representation of the dynamic frequency response of system load.
- Power system inertial response to generation-load imbalance and simulation of system frequency.
- Model of the interconnected control areas including a DC change to AC losses, load flow and swing angle simulation, control area AGC, dynamic load models, and interchange scheduling. The DC load flow dynamically simulates transmission path flows among control areas as the relative phase angles of the interconnected control areas respond to local and system generation – load imbalance.
- A generic AGC system that incorporates typical regulation services in a market environment, including various algorithms for regulation and control exploiting grid connected storage which are used to examine controls design.
- Representation of day – ahead hourly interchange and generation scheduling, load forecasting, and forecast errors. Hourly ramping behavior is also captured.
- Real time dispatch for balancing energy incorporating a market clearing function based on hour ahead bid stacks for inc/dec supply. The real time dispatch model is capable of look-ahead behavior using short-term load forecasting and anticipated generation response to inc/dec instructions.
- Settlements of real time energy based on inc/dec instructions and actual generation.
- Forecasting of distributed generation resources and forecast errors.
- Forecasting of wind velocity and direction and forecast errors. Wind *noise* is correlated in time and space across different wind farm locations. The incorporation of wind farm forecasting and actual production in generation company operations is represented. (Note: For this project this feature was not used as second by second wind farm production was available from the California ISO as a starting point.)
- Wind fall-off behavior and storm shut-off behavior of turbines. (Note: For this project this feature was not used as second by second windfarm production was available from the California ISO as a starting point.)
- Velocity to power conversion of typical wind turbines and turbine grid interconnection, although without fast electrical transient effects. (Note: For this project this feature was not used as second by second windfarm production was available from the California ISO as a starting point.)

A more detailed portrayal of the high level block diagram of KERMIT is shown in figure APA 1.



APA-3

APA-2

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**Appendix B: Calibration Results**

APB-1

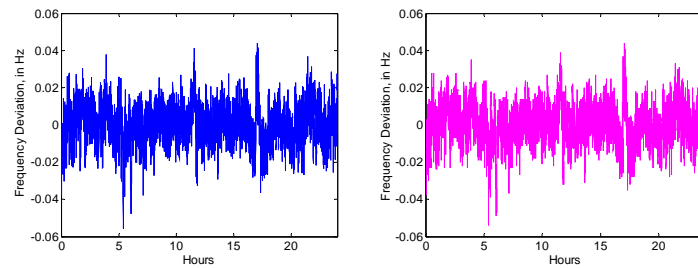
APB-2

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

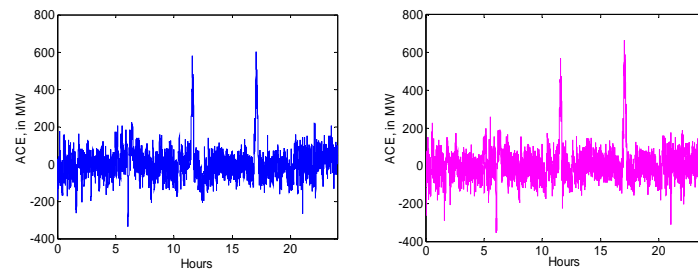
This appendix contains calibration results for each of the days modeled. The graphs compare modeled versus historical data for frequency deviation and ACE. Figures on the left are the model outputs and those on the right are historical data.

**B.1 Monday February 9, 2009**

**B.1.1 Frequency Deviation**



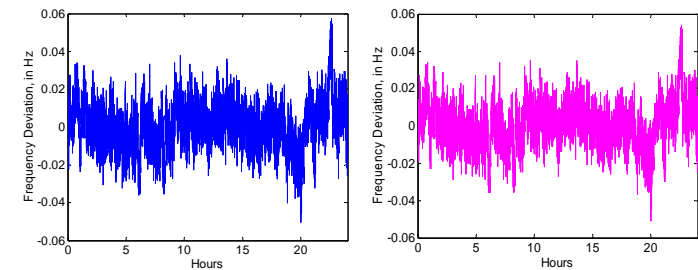
**B.1.2 Area Control Error**



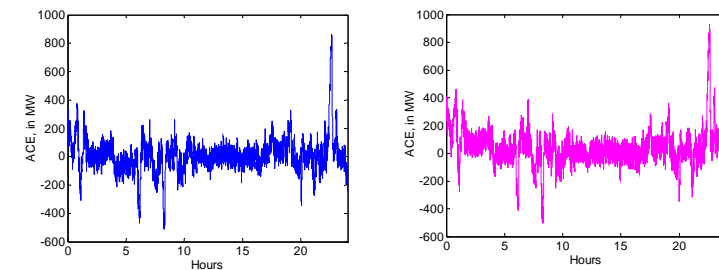
APB-3

**B.2 Sunday April 12, 2009**

**B.2.1 Frequency Deviation**



**B.2.2 Area Control Error**

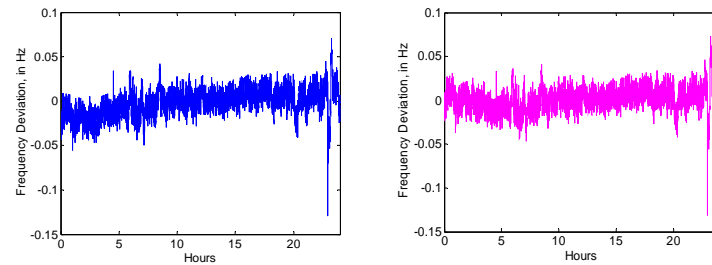


APB-4

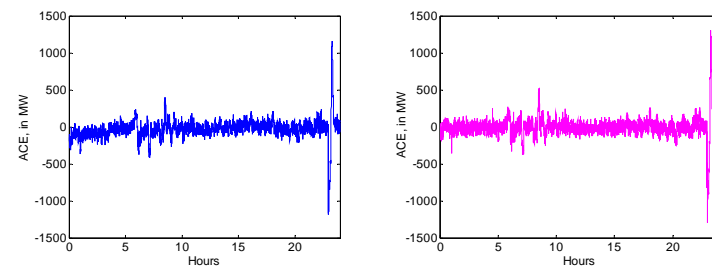
Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**B.3 Monday June 5, 2008**

**B.3.1 Frequency Deviation**



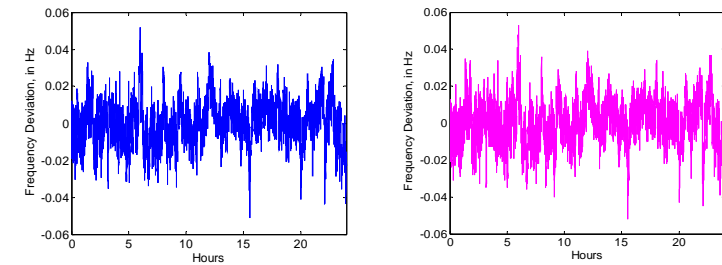
**B.3.2 Area Control Error**



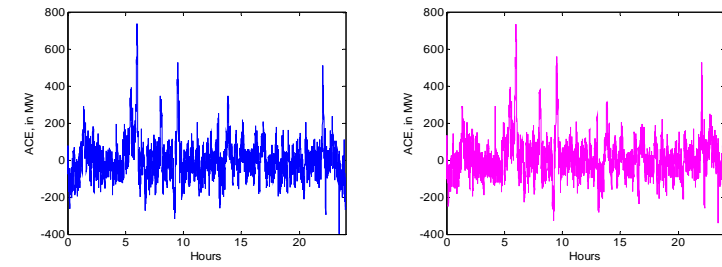
APB-5

**B.4 Monday July 7, 2008**

**B.4.1 Frequency Deviation**



**B.4.2 Area Control Error**

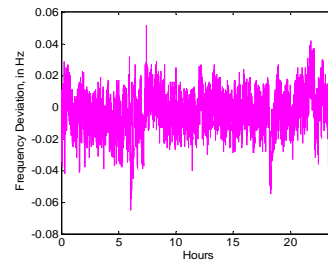
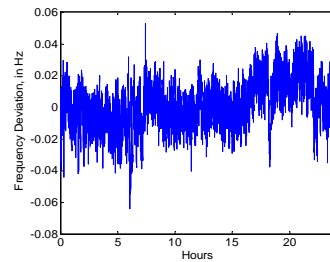


APB-6

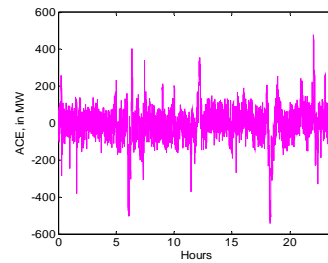
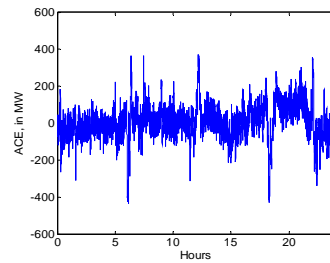
Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**B.5 Monday October 20, 2008**

**B.5.1 Frequency Deviation**



**B.5.2 Area Control Error**



APB-7

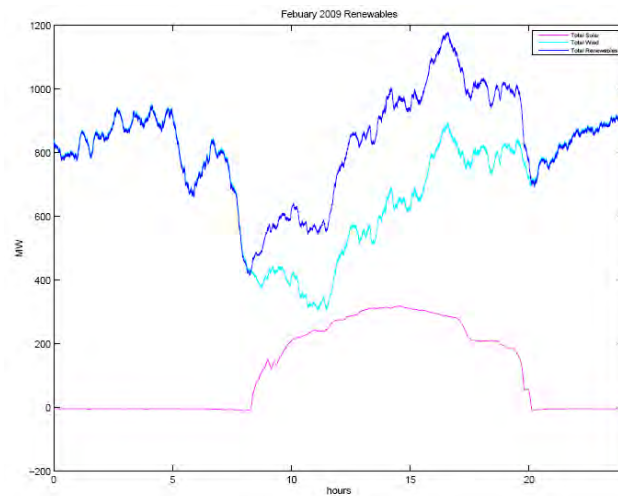
APC-1

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

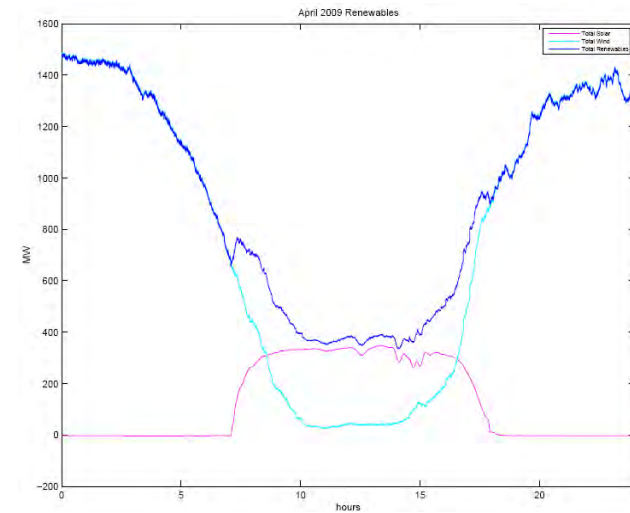
This appendix contains base day characteristics used as inputs to the model. Characteristics include daily load, renewable production, and dispatched generation by type.

**C.1 Renewable Production**

**C.1.1 Base Cases**

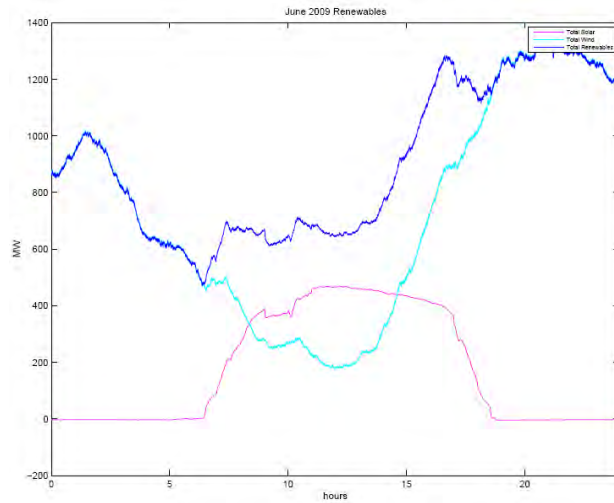


APC-2

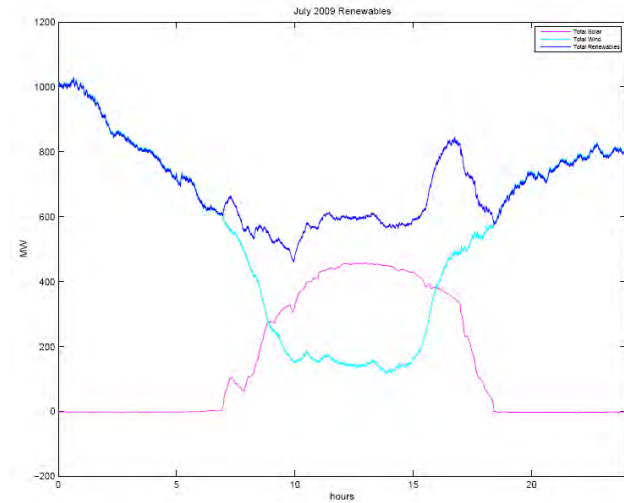


APC-3

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

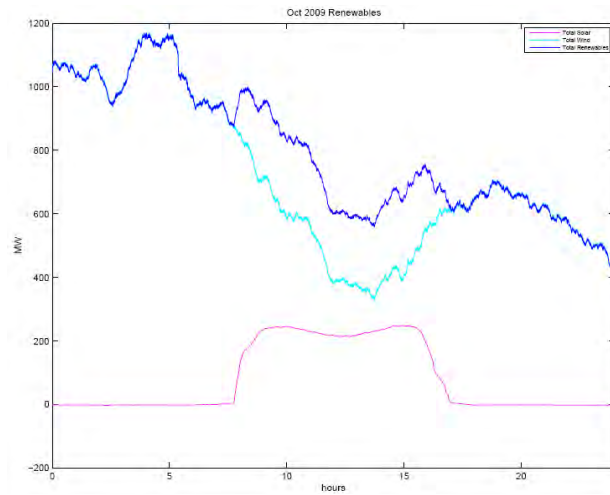


APC-4



APC-5

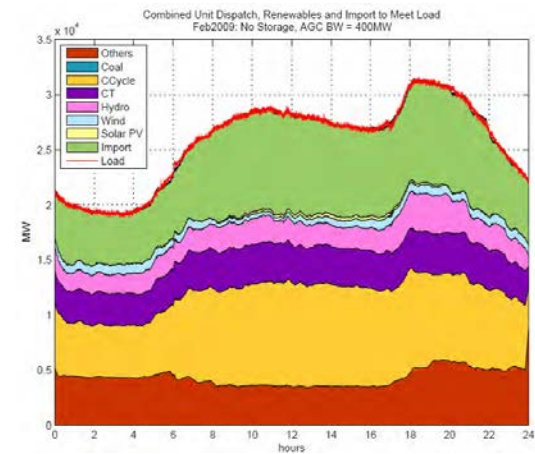
Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



APC-6

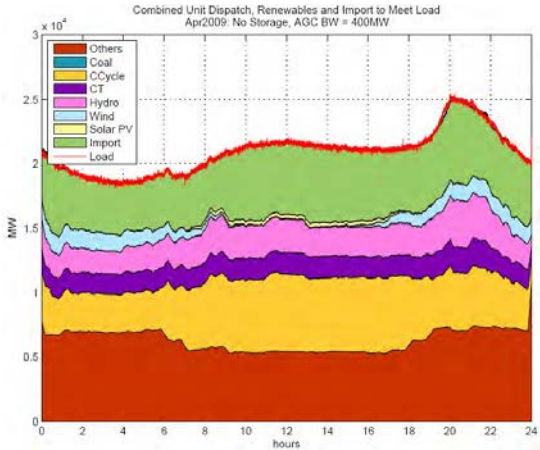
**C.1 Total Dispatch**

**C.1.1 Base Cases**

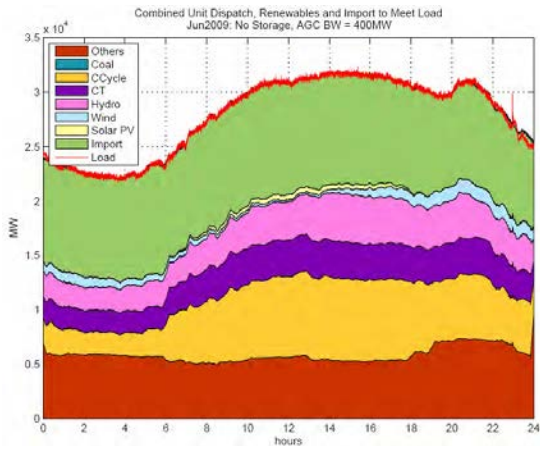


APC-7

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

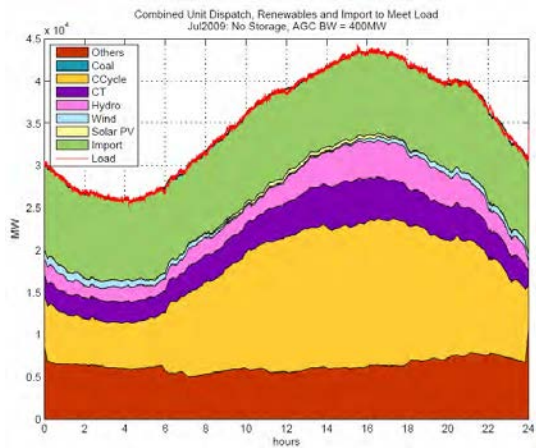


APC-8

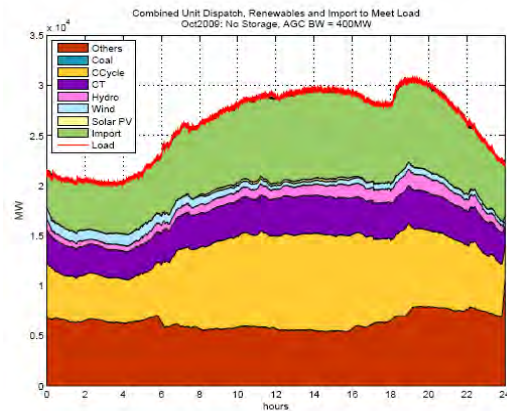


APC-9

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



APC-10



APC-11

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**Appendix D: Results without Storage or Increased Regulation**

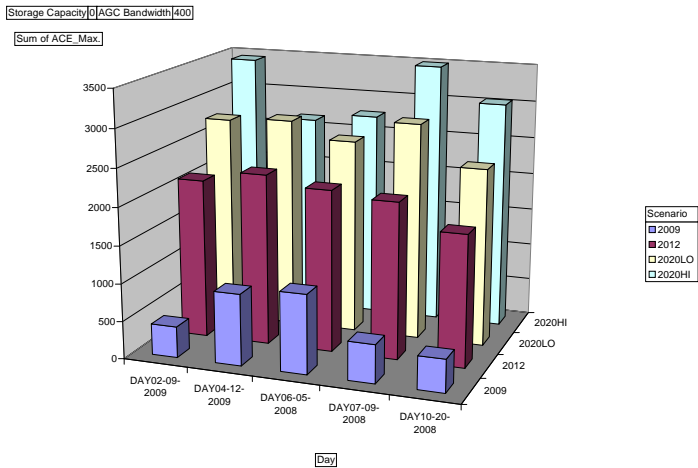
APD-1

APD-2

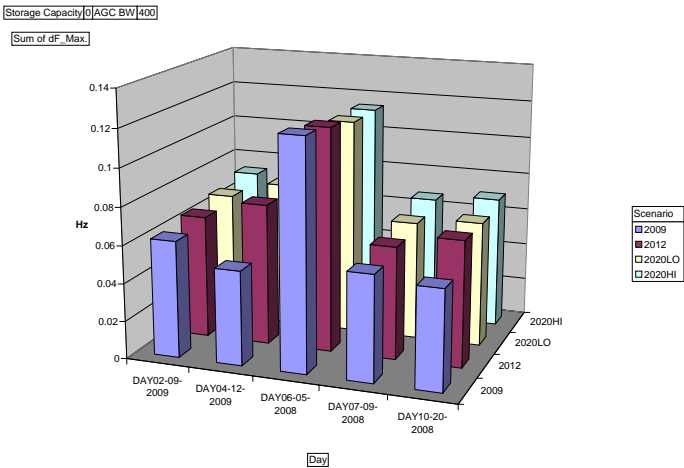
Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

This appendix contains results for system metrics across all scenarios. Metrics include maximum ACE, maximum frequency deviation, and CPSI.

D.1 Summary Results

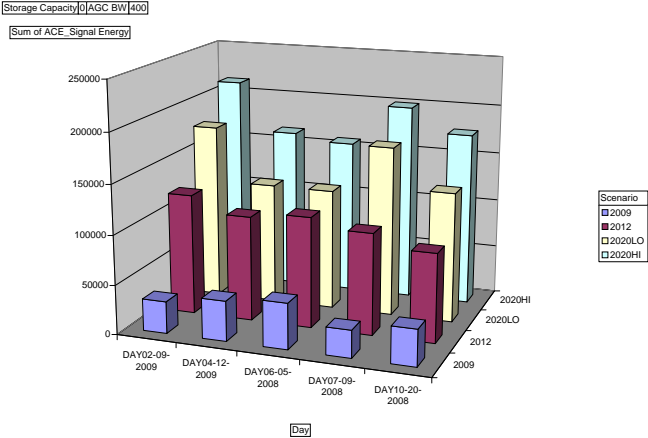


APD-3

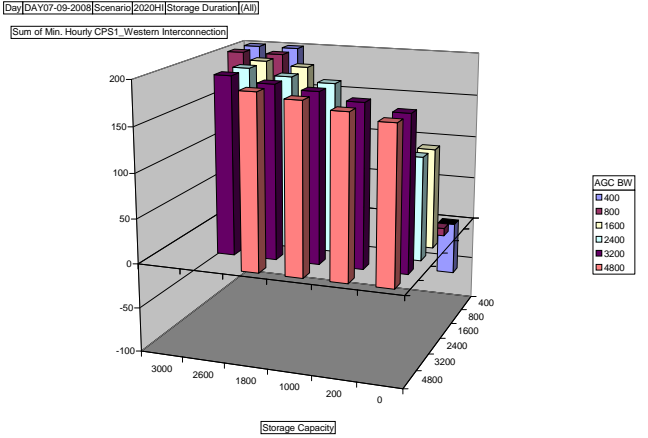


APD-4

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



APD-5



APD-6

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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## The California Electricity Crisis: Causes and Policy Options

• • •

Christopher Weare

2003

PUBLIC POLICY INSTITUTE OF CALIFORNIA

Library of Congress Cataloging-in-Publication Data

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Christopher Weare.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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## Foreword

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Understanding the interplay of events behind California's recent energy crisis is a formidable challenge. Even more formidable is imagining the policy changes that can rebuild the state's energy markets. Christopher Weare's report, *The California Electricity Crisis: Causes and Policy Options*, addresses both of these challenges. It serves as a useful guide to a complex chain of events as well as a helpful description of options that state officials will weigh as they design and implement the next set of policy solutions.

Policymakers and general audiences alike can draw several lessons from Weare's analysis. The first is that energy policy is forged out of a complex blend of technical, economic, political, and historical realities. Energy provision, pricing, and distribution are determined by what the engineers know is possible, what the regulators think should be done, and what the politicians want to see. This complexity makes it difficult to implement sweeping changes without generating unintended consequences. As Weare points out, such consequences impose costs of their own, not all of which are well understood when the initial reforms are proposed and implemented.

Related to this first lesson is the possibility that frustrated observers will propose simplistic solutions to complex problems. Some may even try to implement their reforms through the initiative process. If residents wish to avoid price swings in their electricity bills, a proposition to this effect could gain widespread support. Such solutions, however, could make efficient and low-cost energy even more difficult to provide. One gathers from Weare's analysis that accommodating the intricacies of this market and crafting effective solutions will be a difficult task no matter who controls the policy levers in Sacramento.

A second lesson is that the federal government (and especially the Federal Energy Regulatory Commission) will provide the framework for any subsequent energy policy. For over a decade now, politicians have

successfully pushed for the devolution of political power to state and local governments. However, if California chooses to reconstitute competitive energy markets, it will have to accept federal review. That process will be no less complicated than balancing the local, state, and federal interests that have accompanied efforts to create efficient water markets in California.

Finally, the electricity crisis has reminded us that Californians—like most Americans—do not like unpleasant surprises. Blackouts, price volatility, excess profits, poor service, and vague promises have combined to reinforce the public's view that Sacramento cannot be trusted. To regain the public's trust, decisionmakers must explain their objectives and then craft a sensible, sustainable policy in a timely fashion. Otherwise, simplistic and possibly draconian solutions may begin to gather support. We trust that this report and its recommendations will help policymakers in their deliberations and planning.

David W. Lyon  
President and CEO  
Public Policy Institute of California

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### Summary

With the passage of AB 1890 in 1996, California led the nation in efforts to deregulate the electricity sector. The act was hailed as a historic reform that would reward consumers with lower prices, reinvigorate California's then-flagging economy, and provide a model for other states. Six years later, the reforms lay in ruins, overwhelmed by electricity shortages and skyrocketing prices for wholesale power. The utilities were pushed to the brink of insolvency and are only slowly regaining their financial footing. The state became the buyer of last resort, draining the general fund and committing itself to spending \$42 billion more on long-term power deals that stretch over the next ten years. The main institutions of the competitive market established by AB 1890, the Power Exchange and retail choice in particular, have been dismantled.

The debate over the exact causes of the crisis continues. Many wish to distill the genesis of the crisis to simple themes. Some, most notably major political actors in California, lay principal blame on market manipulation by the merchant generators. Others, including the Federal Energy Regulatory Commission and energy firms, point to flaws in the state's restructuring plan and a fundamental supply and demand imbalance. Any search for simple answers, however, risks misperceiving the intricacies of the systemic failure of California's electricity sector. A satisfactory explanation for the severity of the crisis and its consequences cannot be composed based on any single factor. Rather, a number of factors must be considered. These include:

- A shortage of generating capacity,
- Bottlenecks in related markets,
- Wholesale generator market power,
- Regulatory missteps, and
- Faulty market design.

No single factor can fully account for the crisis. The fault cannot be pinned entirely on the shortage in generating capacity. The worst of the crisis occurred during the winter of 2000–2001, when demand was low and plenty of capacity should have been available. Similarly, market manipulation by generators does not tell the whole story. There is evidence of the exercise of market power, but increased input costs and demand also pushed market prices higher. Although the division of regulatory authority between California and the federal government led to catastrophic policy paralysis in response to the crisis, it cannot be blamed for the run-up in wholesale rates that instigated the crisis. Finally, flaws in the restructuring of the electricity sector did exacerbate the crisis, but the market had been working reasonably well for the first two years of its operations.

Because California's experience was unique and because a number of factors were simultaneously at play, it is not possible to disentangle fully how each distinctly contributed to the blackouts, major financial crisis, and the systemic breakdown of market institutions. Some important conclusions can, nevertheless, be offered.

First, California's electricity sector was rocked by a number of events unrelated to restructuring: the rise in national natural gas prices, higher costs for pollution permits, and a drought in the Northwest which reduced available imports of electricity. Even if the electricity sector had remained regulated, prices would have increased, and some blackouts would have possibly occurred between May 2000 and June 2001.

Second, although regulators have yet to uncover a smoking gun clearly establishing that merchant generators strategically manipulated wholesale market prices, market and regulatory conditions created an environment ripe for the exercise of market power.<sup>1</sup> The shortages in generating capacity played a critical role, increasing the bargaining strength of merchant generators and signaling the enormous profits that could be gained through supply shortages. At the same time, the excessive reliance

<sup>1</sup>Recently, regulators have uncovered evidence of market manipulation strategies employed by Enron and other electricity trading firms. These strategies, however, targeted small ancillary markets, such as those that manage congestion on transmission lines. They did not uncover any evidence of manipulation of the main market for wholesale power.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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on the spot market increased the opportunities and incentives for generators to increase their prices well above the costs of generating power. Third, California relied far too much on the spot market for wholesale power instead of securing power through more stable long-term contracts. This choice exposed the utilities to exceptional risks, producing a full-blown financial fiasco. Finally, the division in regulatory authority between state and federal regulators impeded policymakers from developing a rapid, coordinated, and effective response before major damage was inflicted on the electricity sector, the California economy, and all Californians.

Because the crisis has left California's energy sector in such disarray, policymakers face the daunting task of reconstructing the market and regulatory institutions of the electricity sector almost entirely from scratch. Decisions over the long-run institutional structure of California's electricity sector are complicated by the complexity of the issues that the crisis unearthed and the wide range of options being debated. Serious proposals representing almost the entire spectrum of economic philosophies are receiving significant attention. These include calls for increased public ownership of the electricity sector, a return to the system of regulated, vertically integrated utilities, and recommendations for further deregulation. We examine the costs and benefits of these major options, focusing on six primary goals for the electricity sector:

- Low prices,
- Stable bills for customers,
- Efficient use of resources by producers and consumers,
- A reliable supply of electricity,
- Administrative feasibility, and
- Protection of the environment.

Overall, policymakers face a choice between the greater stability, reliability, and administrative feasibility provided by public ownership or regulated regimes versus the prospects for greater efficiency gains through competitive markets. In terms of environmental protections, no regime clearly dominates the others, mainly because environmental results

depend on complex interactions between each regime and existing environmental regulations.

Eventually, movement to reinstate elements of the competitive regime, in particular competitive wholesale generation, is almost inevitable. The federal government continues to push for greater wholesale competition through the creation of regional trading organizations. In addition, technological advances create ever-smaller plants that can generate electricity at competitive costs, facilitating entry by new firms and enabling large customers to self-generate. Efforts to bottle up these sources of power through public ownership or regulation become increasingly difficult and inefficient. In the short run, policymakers may choose to restrain the development of competitive generation markets if they wish to promote a more stable electricity sector and are wary about ceding control to the Federal Energy Regulatory Commission for mitigating the market power of competitive generators. Nevertheless, they should exercise caution in making short-run choices that erect barriers against loosening these constraints on competition in the future.

On the retail side of the market, the tradeoffs between regulated and competitive structures depend on consumers. Potential efficiency gains from competition are derived by changing consumer behavior, making them more aware of the real costs of electricity and allowing them to change their consumption accordingly. These gains can come about, however, only if consumers are exposed to price volatility and are willing and able to manage that volatility. If consumers wish to be shielded from such volatility and wish to remain passive consumers of energy, the benefits of a competitive regime are reduced. Concerns over the ability of consumers to manage electricity price volatility suggest that hybrid models that introduce retail competition in stages, first to larger customers and only later to smaller customers, offer important advantages.

The report also offers three recommendations for policy changes that can improve the performance of the electricity sector under any particular regulatory and market structure. The first is to strengthen and institutionalize demand-management programs. Electricity sector restructuring ignored and often undermined demand-side management.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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Regulators failed to promote retail competition. Funding for conservation programs was reduced, and consumers were shielded from price fluctuations. As policymakers continue to seek ways to balance the supplies and demands within California's electricity sector, demand management cannot be left out of the equation. These programs can lower energy costs, improve efficiency, and enhance system reliability. In addition, promoting demand management can make individuals and firms more intelligent consumers of electricity, facilitating the introduction of retail competition and enabling them to benefit from competitive offerings.

The second recommendation is to develop a capacity for more comprehensive planning and oversight of California's energy infrastructure. Inadequate transmission capacity, overreliance on natural gas plants, bottlenecks in natural gas pipelines, and inadequate natural gas storage all contributed to the state's troubles. An overarching review of these interlocking infrastructure components is necessary to ensure that private investments are adequate and to identify areas in which public investment or coordination is required.

The third recommendation is to reassess and reorganize the complex set of administrative structures that currently exist. Electricity sector restructuring followed by crisis has led to an ad hoc and confusing mix of state agencies and departments. This fractured and overlapping set of agencies leads to inefficiencies, conflicts, and policy confusion. It must be redesigned for effective policy development and implementation and to provide a more certain environment for producers and consumers.

California policymakers need to take away a number of hard-earned lessons from the crisis. The complexity of electricity markets cannot be underestimated, and seemingly inconsequential details of market design can have significant and unexpected consequences. Specifically, heavy reliance on spot markets is extraordinarily risky. Policymakers must also appreciate the extent to which the state's control over the electricity sector has been circumscribed by the split of regulatory authority between the state and federal governments. Finally, if market-based reforms are to be successful, firms and consumers must become more responsive to market incentives and risks. During the restructuring of the electricity sector, however, utilities and consumers continued to

operate as if the stable and secure rules of regulation still held, leaving California woefully unprepared for the price spikes in 2000.

At this juncture, policymakers must focus on forging a consensus on the future direction of California's electricity sector. Continued ambiguity and conflict lead to market uncertainty, stifle investment in critical infrastructure, and risk repeating errors that precipitated the crisis. Agreement on the broad outlines of a regulatory and market structure, even without the details specified, would do much to improve the investment environment and enable California to move forward.

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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Acronyms

AB	Assembly bill
CEC	California Energy Commission
CERA	Cambridge Energy Research Associates
CPA	California Consumer Power and Conservation Financing Authority, also known as the California Power Authority
CPUC	California Public Utilities Commission
CTC	Competitive transition charge
DWP	Department of Water and Power
DWR	Department of Water Resources
EOB	Electricity Oversight Board
ESP	Electricity service provider
FERC	Federal Energy Regulatory Commission
GWh	Gigawatt hour
ISO	Independent System Operator
kWh	Kilowatt hour
MMBtu	Million British thermal units
MMcf	Million cubic feet
MW	Megawatt
MWh	Megawatt hour
NOx	Nitrogen oxide
PG&E	Pacific Gas & Electric

PX	Power Exchange
QF	Qualifying facilities
RECLAIM	Regional Clean Air Incentives Market
RTP	Real-time pricing or real-time prices
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
TOU	Time of use

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### 1. Introduction

In 1996, California passed AB 1890, a bill calling for the radical restructuring of the state's electricity sector. Competitive markets for wholesale power were inaugurated in April 1998, and in those early years, the markets appeared to function relatively well. As predicted, the wholesale price of electricity declined and average rates fluctuated moderately between \$20 and \$50 per megawatt hour (MWh) (see Figure 1.1). Customers benefited from a 10 percent rate reduction and were protected by a temporary rate freeze. The utilities benefited at the same time, as they were able to pay off the costs of transitioning to a competitive environment.

In the late spring of 2000, however, the electricity sector began to malfunction severely. In June, average prices suddenly rose precipitously, breaking the \$100 per MWh mark. They remained at extraordinarily high rates through the spring of 2001 before they moderated rapidly and

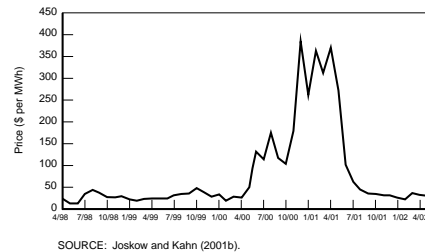


Figure 1.1—Average Wholesale Electricity Prices in California, 1998–2002

unexpectedly in June 2001 (see Figure 1.1). Although total energy costs for wholesale power were \$7.4 billion in 1999, they were about \$27 billion per year from 2000 through 2001, burdening California consumers and businesses with almost \$40 billion in added costs.

The lights flickered throughout the crisis. On June 14, 2000, rolling blackouts in San Francisco caused by a Bay Area heat wave signaled the beginning of rough times. In 2000, electricity was turned off to customers with special interruptible contracts on 13 other days. During 2001, "load shedding" occurred on 31 days. On nine of these days customers experienced involuntary rolling blackouts for a total of 42 hours of outages. During these nine outages, California experienced an average shortfall of 600 MW of electricity, enough energy to power over 450,000 households. On the worst day, January 18, the equivalent of almost one million households lost electricity. The costs of these blackouts are difficult to enumerate, but they are undoubtedly significant.

The soaring prices on the wholesale market wreaked financial havoc on the electricity sector. The customers of San Diego Gas & Electric (SDG&E) felt the brunt of the cost increases immediately. The retail rate freeze imposed on the utilities had been lifted for SDG&E in July 1999. Thus, SDG&E customers were paying electricity rates based on wholesale prices and saw their bills double and triple during the summer of 2000. Customers of Pacific Gas & Electric (PG&E) and Southern California Edison (SCE), in contrast, were shielded from these increases by the retail rate freeze. These two utilities, however, were caught in a financial vise, forced to buy expensive power on the wholesale market and sell it cheaply to retail customers. Soon, SDG&E joined them in this predicament when the legislature passed AB 265, which reimposed a rate freeze for SDG&E customers retroactively.<sup>1</sup> The three major utilities racked up debt at a rapid pace. In January, as their credit worthiness evaporated, the state was forced to become the purchaser of last resort.

<sup>1</sup>AB 265 included provisions to enable SDG&E to recoup the uncompensated costs of buying wholesale power. Thus, it was not placed in the same financial peril as were PG&E and SCE.

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A long list of debts is still being sorted out. Pacific Gas & Electric declared bankruptcy and is arranging in bankruptcy court how to pay creditors about \$13 billion. Southern California Edison accepted a deal with the California Public Utilities Commission (CPUC) in which it will pay off \$5 billion to \$6 billion in debt with a combination of ratepayer contributions, cash on hand, and decreased dividends. The state spent \$8.7 billion on wholesale power in the first half of 2001 and projected that it would spend \$17.2 billion by the end of the year. \$7 billion for these purchases came from the general fund, and the state is still struggling to float a \$12 billion bond to repay the fund. In addition, during the height of the crisis the state began signing long-term contracts for power to secure a source of supply, and it is now committed to purchase \$42 billion worth of electricity over the next ten years.

Beyond this financial turmoil, the crisis caused by the surge in wholesale prices devastated the institutional structures governing the California electricity sector. The private utilities are no longer the main purchasers of power. Instead, the state is more tightly entwined in the electricity market than it has ever been before. The Power Exchange (PX), the central market for trading wholesale power, went bankrupt and closed operations. The Independent System Operator (ISO), designed to manage the electricity grid, has become politicized and is under fire. The state has curtailed retail choice, putting competition on hold, and regulatory authority is now more fragmented, leading to overlaps and conflict. The destruction wrought by the financial crisis and system failure has been so complete that California must re-create the regulatory and market institutions of its electricity sector almost from scratch.

To gain some perspective on the damage inflicted on the California economy, one can compare it with other significant economic failures. This crisis has cost \$40 billion in added energy costs over the last two years. Increased costs will continue as long as the prices in the long-term contracts signed by the state exceed wholesale rates. On top of these costs, one must add the costs of blackouts and reductions in economic growth caused by the crisis.<sup>2</sup> Thus, conservatively, the total costs can be

<sup>2</sup>The national recession has complicated estimating the macroeconomic effects of the crisis, but in June UCLA projected that the crisis would slow the California economy

placed around \$40 billion to \$45 billion or around 3.5 percent of the yearly total economic output of California. Before this crisis, the preeminent example of failure of an electricity system was a default by the Washington Public Power Supply System. It overinvested in nuclear plants and defaulted on its bonds. This default cost the state about \$800 million or 1.5 percent of its total economic output. The Savings and Loan debacle was considered a staggering deregulatory failure, but its total costs of about \$100 billion amounted to only one-half of 1 percent of the total U.S. economy.

Repairing this damage poses a daunting task to California policymakers. Much of the debate and legislative action has focused on the financial dimensions of the crisis. In contrast, the manner in which the state is going to extricate itself from its role as the power purchaser of last resort, reorganize the electricity sector, and regulate it remains imprecise. This report seeks to focus attention on these important institutional questions.

After a brief overview of the regulatory reforms that led to this crisis, this report examines the root causes of the crisis. It finds that blame cannot be easily leveled at any single actor. A combination of unforeseen events, poor decisions, opportunistic behavior, and fragmented regulatory authority all conspired to aggravate the magnitude of the crisis.

Based on this analysis of the root causes of the crisis, Chapter 4 of the report examines a number of frameworks that may guide the reorganization of the electricity sector: increased public ownership, return to a regulated environment, continuing with competitive markets, and hybrids of these options. It concludes that some form of competition should be reinstated, at least for certain industry segments and customer classes. In the short run, however, policymakers may choose to curtail the role of competition for the sake of stability and

in 2002 by between 0.7 and 1.5 percent and would increase unemployment by 1.1 percent. See Cambridge Energy Research Associates (2001b).

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administrative ease and to provide a smoother transition path back to a competitive environment. Chapter 5 then discusses specific policy options that are appropriate no matter which reform path is chosen.

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### 2. Regulatory Context

Before restructuring, the California electricity sector was dominated by three investor-owned utilities: Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric. Together they accounted for 77 percent of customers and 75 percent of all state power sales in 1996. The rest of the industry was composed of four cooperatives and 34 publicly owned utilities, run mainly by municipalities or irrigation districts. The Los Angeles Department of Water and Power (DWP) and the Sacramento Municipal Utility District were the two largest, accounting for approximately 15 percent of California sales.

California differs from the rest of the United States in some important dimensions. California is a light consumer of electricity. Consumption is only 6,400 kilowatt hours (kWh) per resident per year compared to the national average of 11,900 per capita. Similarly, as a percentage of its economic output, California is efficient, requiring only 0.22 kWh for each dollar of state output compared to 0.40 kWh for the country as a whole. California also differs in the mix of generating plants on which it depends. As seen in Table 2.1, California has virtually no coal generation but this is the primary source of electricity for the nation as a whole. The state is richer in inexpensive hydro generation than the rest of the nation but it is much less reliant on it than Oregon and Washington. California has also invested heavily in renewable sources. Most striking is California's heavy reliance on natural gas. Including plants fired by a combination of petroleum and natural gas, over 50 percent of California's electricity comes from this source, compared to only 18 percent nationally.

In the early 1990s, the CPUC began to explore the possibility of restructuring the state's electricity sector to open it up to competitive forces. In February 1993, it issued a report, commonly known as the yellow book, which promoted regulatory reform. As the first serious

Table 2.1  
Generating Capacity by Primary Energy Source, 1999  
(in percent)

Energy Source	United States					
	California	Oregon	Washington	Nevada	Arizona	
Hydro	27	16 <sup>a</sup>	82	84	15	19
Nuclear	8	14	0	4		25
Natural gas	36	18	11	5	35	20
Petroleum/gas combo	16	0	0	1	3	0
Coal	1	44	5	5	44	35
Petroleum	2	9	0	0	1	2
Other <sup>b</sup>	11	0	2	1	3	0

SOURCE: [http://www.eia.doe.gov/cmeu/states/\\_states.html](http://www.eia.doe.gov/cmeu/states/_states.html).

<sup>a</sup>U.S. hydro includes renewables.

<sup>b</sup>Geothermal, wind, and solar.

effort by state-level policymakers to consider a major restructuring of the entire electricity sector, the report marked a major milestone in the deregulation movement in the United States. Electricity markets and regulation had, nevertheless, been undergoing slow but steady liberalization for decades.

In response to the energy shortages of the 1970s, Congress had passed the Public Utility Regulatory Policies Act (PURPA) in 1978. It allowed nonutilities to build qualifying facilities (QFs) that generated electricity with cogeneration technologies or renewable resources and required that utilities purchase this energy. Further actions by Congress and the Federal Energy Regulatory Commission (FERC) continued to loosen the domination of traditional utilities. Congress passed the Energy Policy Act of 1992, allowing independent firms, called exempt wholesale generators (EWGs), to operate generation facilities. FERC issued a number of decisions that granted independent power producers access to the electricity transmission grid that was largely owned by the major, private utilities. By allowing generators to sell electricity to faraway customers, these actions facilitated the development of a fringe market for wholesale power. As seen in Figure 2.1, the percentage of California power generated by nonutilities increased from less than 5

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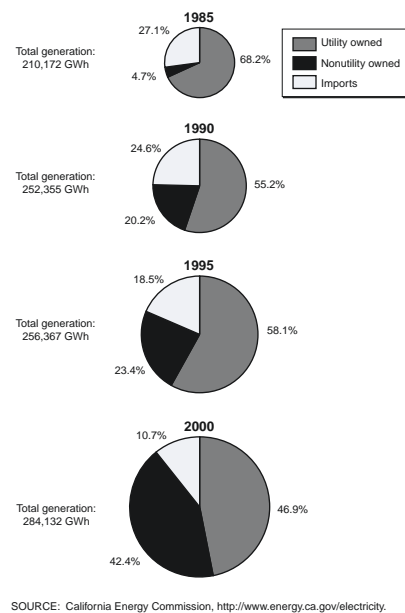


Figure 2.1—Total California Electricity Generation

percent in 1985 to over 23 percent in 1995. Nevertheless, traditional electricity monopolies, regulated by state bodies, continued to control the lion's share of generating plant.

In the early 1990s, interest in restructuring the California electricity sector was spurred by the high cost of electricity. In 1995, because of expensive investments in nuclear power and high-priced contracts for QF power, California consumers paid the highest rates in the western continental United States. The average rate of about 9.9 cents per kWh was more than twice as much as the rates in Oregon and Washington, 60 percent more than that in Nevada, and 30 percent more than that in Arizona. Businesses and industry began to see that new generating facilities could supply electricity at lower prices than the utilities were charging, and they wished to take advantage of these lower costs. Moreover, an increasing number of commentators began to argue that the traditional system of supplying electricity through a vertically integrated, regulated monopoly was a source of these problems. They argued that the regulatory regime provided insufficient incentives to control costs, led to excess generating capacity, and resulted in unwise investments in nuclear power. The United States was benefiting from the success of recent experiments in deregulating the airline, trucking, natural gas, and long-distance telephone industries. The electricity industry was a natural extension of the deregulatory model.

The CPUC held protracted hearings for several years and developed a detailed proposal for deregulation. At that juncture, the legislature became involved, drafting AB 1890, a blueprint for electricity sector reform. The legislation incorporated the central elements of the CPUC plan that restructured the three major, vertically integrated investor-owned utilities. As shown in Figure 2.2, before AB 1890, they owned generation plants, transmission lines, and distribution facilities and marketed all their own electricity. On the fringe, a number of qualifying facilities and exempt wholesale generators produced power and sold it to the three major utilities or to municipal utilities.

AB 1890 sought to break up the utilities and create competitive markets in both the generation and the retail marketing of electricity. As shown in Figure 2.2, competitive wholesale generators were invited into the market. To jump-start competition, the California utilities were

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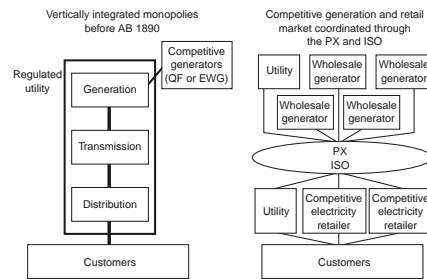


Figure 2.2—AB 1890 Restructured Electricity Sector

given incentives to divest generation facilities. They eventually sold all their fossil fuel plants, almost 19,000 MW of generating capacity, predominantly to five merchant generation firms: Southern Energy, Duke Energy Corporation, Houston Industries, AES Corporation, and NRG Energy.<sup>1</sup> These plants represented 43 percent of the utilities' generating capacity before AB 1890 and were 35 percent of the state's total generating capacity. The utilities retained their nuclear and hydro facilities and their contracts with QFs, but their share of total generation dropped below 50 percent as seen in Figure 2.1.

The utilities handed over the control of their transmission grids to a newly created, independent, nonprofit organization, the California ISO. The ISO was to manage the dispatch of electricity through the grid in a nondiscriminatory manner providing equal access to all generators and power purchasers. In addition, it would maintain system reliability by balancing the demand and supply of electricity in real time. Competitively generated power would be sold through the newly created

<sup>1</sup>PG&E also sold 1,353 MW of geothermal generating capacity to Calpine Corporation.

Power Exchange (PX), which ran auctions for power in day-ahead and hour-ahead markets.

The distribution networks of the old vertically regulated utilities remained regulated, but new electricity service providers (ESPs) would be allowed to enter the market, sign up customers, and provide them with power that they would purchase on the open market. It was expected that most customers would eventually be served by these new ESPs. These arrangements roughly followed the design of the deregulated system in the United Kingdom that inspired the California reform, although it was more ambitious and relied more heavily on markets.

Parallel to the restructuring of the electricity market, regulatory oversight was also fundamentally changed. Before AB 1890, the California Public Utilities Commission was the primary regulator of the state's vertically integrated utilities. It accounted for the utilities' costs of generation, transmission, and distribution and set retail rates that enabled the utilities to recoup those costs with an allowed return on invested capital. The FERC regulated wholesale power sales and purchases by the utilities, but its role was peripheral to state regulatory commissions. As AB 1890 elevated the competitive wholesale market to a central role in the restructured electricity sector, FERC assumed a dominant regulatory position, overseeing the operation of the PX and ISO and regulating rates for wholesale power and transmission. California's role, in contrast, was diminished, limited to the regulation of retail rates and distribution.

The legislature added a number of pertinent features to AB 1890 designed to satisfy major stakeholders. A roadblock to regulatory reform was the existence of stranded costs—reductions in the value of utility assets caused by the transition from a regulated to a competitive environment. Wholesale prices were expected to decrease after deregulation, leaving the utilities unable to recover unamortized investments they had made as regulated monopolies. These included generating facilities, mostly nuclear plants, and high-priced, long-term contracts with QFs. Utilities resisted deregulation as long as it would force them to write off these costs. To placate the utilities, AB 1890 allowed them to recoup these stranded costs through a state bond issue and a competitive transition charge (CTC). In the interest of consumers, AB 1890 cut retail rates by 10 percent (about the same amount as the

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CTC) and froze rates until utilities had completed paying off their stranded costs. In addition, supporters of the environment and conservation received some subsidies. Overall, the legislation promised benefits for industry, small customers, utilities, and the environment. It passed both houses of the legislature unanimously and was signed by Governor Pete Wilson on September 23, 1996.

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### 3. Root Causes of the Electricity Crisis

The causes and consequences of the crisis are multiple, complex, and intertwined, but there is wide agreement concerning the broad causal factors of the crisis. Almost unanimously, analysts cite five significant factors:

1. A shortage of generating capacity,
2. Bottlenecks in related markets,
3. Wholesale generator market power,
4. Regulatory missteps, and
5. Faulty market design.

There remains significant debate over the relative importance of each of these factors. Some, most notably major political actors in California, wish to lay principal blame on market manipulation by the merchant generators. Others, including the Federal Energy Regulatory Commission and energy firms, have pointed mainly to flaws in the state's restructuring plan. Any search for simple answers, however, risks misperceiving the intricacies of the systemic failure of California's electricity sector. A satisfactory explanation for the severity of the crisis and its consequences cannot be composed based on any single factor. All of these factors contributed and reinforced one another to create a unique and explosive combination.

#### A Shortage of Generating Capacity

The tight supply of electricity generating capacity beginning in the summer of 2000 appears to be the primary cause of the California electricity crisis. The evidence indicates that tight supply was a necessary antecedent to the crisis. During the early years of the wholesale market,

electricity supply was ample, and the market worked reasonably well.<sup>1</sup> Evidence from other markets also indicates that markets are most competitive when there is ample supply to meet demand, but as the supply of electricity tightens markets become less competitive (Bushnell and Saravia, 2002).

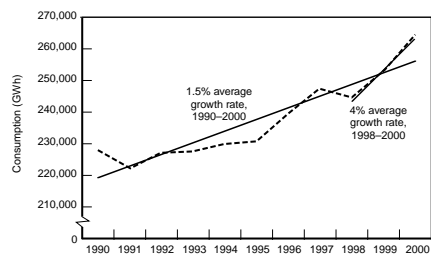
The statistics clearly demonstrate an increasingly tight electricity market.<sup>2</sup> Total consumption in California steadily increased by about 1.5 percent per year between 1990 and 2000 (see Figure 3.1). In addition, there was a surge in demand of about 4 percent per year between 1998 and 2000, driven by the then-booming economy. It is important to note, however, that growth in demand during the 1990s was actually lower than the rate of growth during the 1980s, even when considering the effects of increased population and economic activity (Brown and Koomey, 2002).

The growth rates in neighboring states were significantly higher. Nevada's electricity demand grew at a 6.2 percent yearly rate between 1988 and 1998, and Arizona's demand grew 3.7 percent per year. Higher demand in neighboring states is significant because California had historically relied on imports from other states for about 20 percent

<sup>1</sup>A 1999 conference at the University of Southern California evaluated restructuring and gave it positive marks (USC School of Policy Planning and Development, 1999). Other early analyses of the California experiment note problems with market design (Joskow, 2000; Hogan, 2001b). However, these authors indicate that these issues were being addressed, and they find no evidence of an impending crisis.

<sup>2</sup>It does require some care, however, to interpret and compare the various statistics on energy consumption and generation. First, generation capacity (measured in MW) and total generation (measured in MWh) numbers are often used interchangeably. Although they are related, the main focus should be on generation capacity available for peak demands. Because the load profile for California appears to be flattening (e.g., the average electricity use of all hours in a day is closer to the peak demand), the effects of increased total use on peak demand have been mitigated. Also, researchers employ statistics from a number of agencies (e.g., the California Energy Commission (CEC), ISOs, proprietary data, and the U.S. Energy Information Administration). They also employ statistics for different geographical service areas (e.g., the western region, California, and California served by utilities). There are disparities between these statistics, and a detailed understanding of how they are collected is required before they can be compared correctly.

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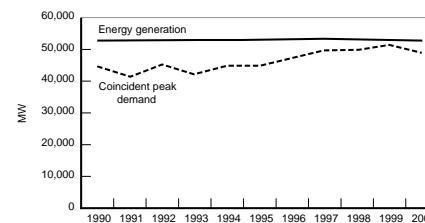
SOURCE: California Energy Commission, <http://www.energy.ca.gov/electricity>.

Figure 3.1—Total Electricity Consumption in California, 1990–2000

of its electricity needs. Thus, a major source of supply was being eaten up by growth outside California.

California Energy Commission data show that peak demand—the total amount of electricity consumed during the one-hour period each year that experiences the highest demand—grew more slowly between 1990 and 2000, with an annual growth rate of 1.0 percent (see Figure 3.2). The peak demand increased more slowly for reasons that remain obscure. The rise of the high-tech sector may have increased the demand for the continuous operation of computers and networks, thereby increasing energy use relatively more during nonpeak, night hours.

Despite this growth in demand, capacity remained stagnant (see Figure 3.2). Consequently, reserves—the amount of generating capacity available above current demand—fell from over 12 percent to less than 5 percent of capacity (see Figure 3.3). Reserves are essential for maintaining reliable delivery of electricity by enabling the system operator to react to surges in demand or failures in either generating stations or transmission links. The California ISO, for example, calls an emergency Stage 1 alert and requests users to reduce power demand



SOURCE: California Energy Commission, <http://www.energy.ca.gov/electricity>.

Figure 3.2—Peak Demand and Generation Capacity in California, 1990–2000



SOURCE: California Energy Commission, <http://www.energy.ca.gov/electricity>.

Figure 3.3—Total Reserves for Yearly Peak Demand in California, 1988–2001

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whenever reserves fall below 7 percent. If reserves fall below 1.5 percent, the ISO begins to implement rolling blackouts. Traditional industry practice has been to maintain a reserve margin of 15 percent or more, although California had been able to maintain lower in-state reserves because of the availability of imported power.

Although the shortage in generating capacity is not disputed, the ultimate factors that led to the shortage are more controversial. Finger-pointing flourished as commentators blamed deregulation, inaction by the governor, generating firms, and the design of market institutions. Each of these explanations contains an element of truth, but responsibility for the shortage cannot easily be placed on the shoulders of any single actor or institution. The shortage was largely a historical accident, characterized by a unique confluence of factors. A number of unforeseen events combined to lay the foundations for a supply crunch, and regulatory and market failures exacerbated the shortage. Each of these factors is examined in turn.

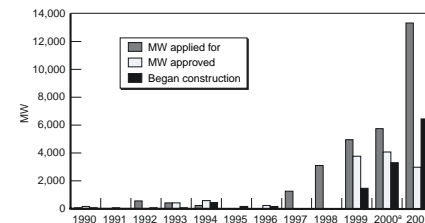
### Unforeseen Events

In a well-functioning electricity system, either regulated or market based, it is important to maintain a balance between available generating capacity and peak electricity demand. Excess capacity is unwanted because it increases the average cost of electricity generation, and insufficient generating capacity leads to the risk of blackouts. This balance, however, can be easily upset in the short term because demand for electricity can change much more quickly than the time it takes to design, gain approval for, and construct new generating plants.

Shortages have been rare in the United States because an emphasis on reliability has meant that added capacity was built well in advance of need. Nevertheless, short-term problems have occurred. In 1948, after a spurt of rapid post-World War II growth and an extended drought, Northern California experienced a series of blackouts before rains refilled reservoirs (Ross, 1974). In the late 1990s, a confluence of unexpected events combined to produce a similar short-lived imbalance in generating capacity. Market players were caught by surprise by the surge in demand in California and throughout the West in the late 1990s. Generating firms were in the process of planning and building additional capacity.

Between 1997 and 2000, they filed applications to build nearly 15,000 MW of generating capacity (see Figure 3.4). Generator firms, however, appear to have been planning that market demand would outstrip available supply only in 2001 and later. None of these plants were scheduled for completion in 2000, and less than 2,000 MW were scheduled to be available by the summer of 2001. Because of faulty market expectations, these new plants arrived later than needed, leading to interim shortages.

The California Energy Commission contests this story, pointing to forecasts dating as far back as 1988 that correctly predicted demand for 2000 and 2001 (California Energy Commission, 2001). The implication is that industry insiders should not have been surprised by the demand for electricity and should have been investing to meet expected demand. The CEC forecasts, however, did not consider how unexpectedly strong



SOURCE: California Energy Commission, [http://www.energy.ca.gov/siltingcases/projects\\_since\\_1976.html](http://www.energy.ca.gov/siltingcases/projects_since_1976.html).

<sup>a</sup>In 2000, 16 plant applications were recorded for 5,740 MW. Of those, eight applications for 1,184 MW were withdrawn. One plant for 99 MW was withdrawn after approval.

<sup>b</sup>In 2001, 45 plant applications were recorded for 13,309 MW. Of those, eight applications for 1,509.6 MW were withdrawn. Two plants for 242.4 MW began construction but were later withdrawn (they are not included in the number of MW that began construction).

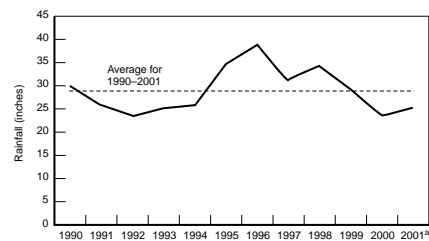
Figure 3.4—Generation Applications and Approvals, 1990–2001

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demand growth outside California would reduce the availability of imported power.

California and the West were also hit by unfavorable weather conditions. The winters of both 2000 and 2001 were relatively dry in the West, and in particular in the Northwest (see Figure 3.5). Consequently, the amount of hydro generation available was severely reduced. Estimates indicate that in the summer of 2000, there were 8,000–12,000 fewer megawatts of hydro power available for import into California, representing up to 20 percent of California's summer demand (California State Auditor, 2001a, p.59). In addition, these conditions were combined with an unusually hot summer in 2000 that drove up electricity demand throughout the western United States (see Figure 3.6). As shown in Figure 3.7, these conditions combined to reduce electricity imports to California to their lowest levels in ten years.

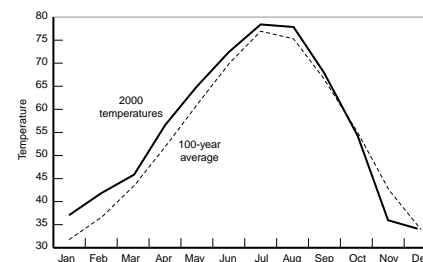
From the summer of 2000 through the winter of 2001, supply shortfalls were exacerbated by unscheduled outages of generating facilities (see Figure 3.8). These high levels of outages were to some degree coincidental. They were due in part to poor coordination of standard



SOURCE: Western Regional Climate Center, <http://www.wrcc.dri.edu>.

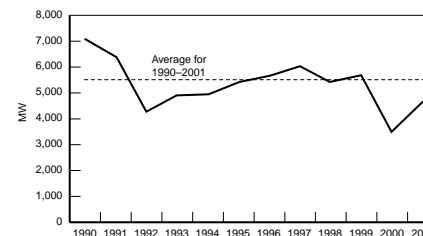
<sup>a</sup>Does not include December.

Figure 3.5—Average Yearly Pacific Northwest Rainfall, 1990–2001



SOURCE: Western Regional Climate Center, <http://www.wrcc.dri.edu>.

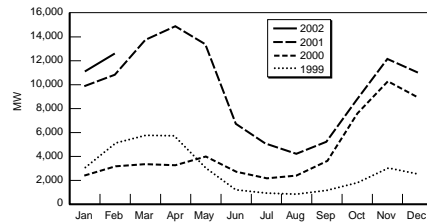
Figure 3.6—Monthly Temperatures in the Western United States, 100-Year Average and 2000



SOURCE: California Electricity Commission, Electricity Office, [http://www.energy.ca.gov/electricity/electricity\\_generation.html](http://www.energy.ca.gov/electricity/electricity_generation.html).

Figure 3.7—Total Imported Electricity for California, 1990–2001

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SOURCE: California Energy Commission, [http://www.energy.ca.gov/electricity/1999-2001\\_monthly\\_off\\_line.html](http://www.energy.ca.gov/electricity/1999-2001_monthly_off_line.html).

Figure 3.8—Average Daily Forced or Scheduled Megawatts Off-Line by Month, 1990-2002

maintenance. For example, in the fall of 2000, 5,000 MW of power was taken off-line when nuclear plants scheduled maintenance at the same time. Plant operators have also pointed to the age of generation plants and to the fact that they were suffering from deferred maintenance because of heavy use in the early months of 2000. As will be discussed below, others disagree, contending that producers were strategically withholding their plants from the market in an effort to exercise market power and increase the prices they received.

#### Regulatory Failures

The regulatory environment following the passage of AB 1890 also contributed to the tightening supply situation. During the implementation of the market restructuring, regulatory uncertainty was pervasive as market rules were amended frequently. In addition, Proposition 9 was placed on the ballot in November 1998. It aimed to restrict the payments the utilities could receive for their stranded costs, thereby clouding the future of the California deregulation. It was eventually defeated by more than a 2-to-1 margin but, nevertheless, it

diverted attention away from plant construction at an important juncture.

This uncertainty was not unique to California. Throughout the United States, federal and state regulators were moving away from cost-based regulation of vertically integrated monopolies. As part of this transition, utilities abandoned their traditional role of constructing capacity. Since the mid-1980s, virtually all capacity additions were constructed by unregulated wholesale generators, but the rules under which these wholesale generators would operate remained incomplete, leading, at least in part, to a more general decline in investment throughout the United States (Joskow, 2000, p. 153; Bushnell and Saravia, 2002).

Several reports have also criticized the environmental review and siting process as too long and too expensive, hindering investment (Bay Area Economic Forum, 2001a; Cambridge Energy Research Associates, 2001a). For example, the average length of the permitting process in California is 14 months compared to only seven in Texas (Bay Area Economic Forum, 2001a; Smith, 2001). The California State Auditor found that for projects proposed since the beginning of 1997, the CEC missed its own one-year deadline in 11 out of 15 cases (California State Auditor, 2001b). Public opposition to projects did contribute to delays but it was not the only impediment to approval. The applicants themselves caused significant delays as they amended applications and submitted documents late. Other government agencies, such as air quality districts, also contributed to the length of the process, forcing the CEC to wait for necessary inputs.

The record of the last few years does suggest that regulatory uncertainty and a slow review process delayed the construction of new capacity. The California State Auditor identified over 1,000 MW of capacity that could have been available during the critical months in the late spring and early summer of 2001 if the CEC had completed siting review in a timely manner. Nevertheless, these environmental regulations do not appear to have been a critical impediment to investment. The average length of siting reviews since the passage of AB 1890 has not been appreciably longer than reviews in the 1970s and 1980s. A review took on average one and one-half months longer, and

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much of this increase can be accounted for by the fact that more recent projects tended to involve fossil fuels rather than solar and geothermal energy and were submitted by firms with less experience with the siting process (California State Auditor, 2001b). In any case, as is shown by Figure 3.4, even during the early, more uncertain years of the California electricity market, investors still submitted applications to increase California electricity generating capacity by over 20 percent.

Other regulatory decisions not related to environmental review may have had a greater effect in reducing the number of projects undertaken. For reasons discussed in greater detail below, the California Public Utilities Commission issued a number of decisions that restricted the ability of the three main utilities to enter into long-term, bilateral contracts with electricity generators. Firms seeking to construct electricity generators commonly use such contracts to assure banks and potential investors that there is a market for additional electric power and that the proposed plant will be profitable. These restrictions on the utilities removed the main potential purchasers of long-run contracts from the market, increasing the risk of construction, and limiting the amount of financing available (Bay Area Economic Forum, 2001a; Cambridge Energy Research Associates, 2001a). Although these restrictions likely reduced the level of planned investment, the number of forgone projects is not known.

At the same time that regulators may have impeded private sector decisionmaking, they were relinquishing their role in the energy planning process. Before deregulation, the California Energy Commission produced comprehensive biannual evaluations of the state of the California electricity sector, but its role in resource planning was significantly diminished with the advent of deregulation. At the same time, conservation efforts diminished. Before deregulation, California had a number of innovative programs that provided utilities with incentives to invest in conservation in lieu of capacity expansion. In the early 1990s, these mandated comprehensive reviews of energy alternatives identified numerous cost-effective investments in energy-saving technologies and conservation programs (Mowris, 1998). Utilities invested as much as \$400 million a year to promote these investments and programs. In the move to a competitive environment, these

programs lost their constituency and momentum, largely because regulators lost the policy levers with which they provided incentives. AB 1890 did provide for continued support of such investments, but only at a much reduced level—about \$220 million per year (Harvey et al., 2001).

#### Market Failures

Causes for underinvestment in generating capacity can also be found in the structure and operation of electricity markets.<sup>3</sup> Generators may have been reluctant to invest in capacity because the market failed to send strong signals that additional investments were required. The California market relied completely on spot market prices for wholesale power to signal that future investments in capacity would be profitable. In theory, when spot market prices increased or were projected to increase, generators would come forward with new investments. For the first two years after the deregulation, however, a glut of electricity drove the wholesale price to low levels. Until May of 2000, the average wholesale price of a megawatt hovered around \$30 and never rose above \$50. If generators focused myopically on current prices, they had little incentive to undertake new projects until supplies tightened and the spot market increased.

Because of the nature of the electricity markets, however, spot market prices are quite volatile when supplies become scarce (Borenstein, 2001). Electricity cannot be stored and there are strict constraints on the amount of electricity that can be generated and delivered at a particular time. In addition, in the short run, consumers have limited options for reducing their electricity consumption. Consequently, when an electricity market nears its maximum capacity, extreme price spikes can occur before generators bring on additional supplies, consumers reduce demand, and the market is brought back into equilibrium.

These characteristics of electricity markets can lead to boom and bust cycles in investment. Low prices impede investment until the market

<sup>3</sup>A highly contentious debate centers on the question of market power—whether suppliers withheld capacity from the market in an effort to increase prices and profits. We discuss this issue below.

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tightens, leading to marked increases in prices. A rush of investments induced by high prices then frequently leads to over capacity and collapsing prices. This cycle has been evident since the crisis abated in the summer of 2001. After wholesale prices plummeted, investments in generating capacity became less attractive, and since the collapse of Enron Corporation, investors have shied away from committing their capital to large electricity-related investments. As a consequence, plans to build several new power plants have been cancelled or postponed, raising the prospect that California may experience new shortages as soon as 2004 (Tucker, 2002). Other markets, such as commercial real estate and microchips, which also involve large, capital-intensive investment with long planning horizons, have experienced such swings in capacity.

In sum, much of the blame for the dramatic increases in wholesale electricity prices experienced during the summer of 2000 can be related to inadequate supply. Although merchant generating firms had been applying for permits and had begun construction of additional capacity, these investments were slowed by the low levels of wholesale prices before the summer of 2000, regulatory uncertainty, a sluggish environmental review process, and financing impediments. It is not possible to determine the number of megawatts of additional capacity that could have been made available earlier absent these impediments, but a reasonable lower-bound estimate would be that the 1,415 MW of capacity completed in 2001 for which application had been filed in 1997 and 1998 could have been available sooner.

Unforeseen events, in contrast, had clearer and quite significant effects on reducing available supply. Reduced imports, resulting from weather conditions and increased demand in neighboring states, had the largest effect, reducing available capacity by the equivalent of up to 12,000 MW. Poor coordination of plant outages decreased available supply by about another 1,000 MW during the summer of 2000. These supply reductions constituted a significant portion of the approximately 50,000 MW peak summer demand. These events alone turned a situation of adequate supply into a shortage. It is possible that more favorable weather conditions, a downturn in the state's economy, or better operation of existing capacity could have saved California from its crisis during the summer of 2000. Then the thousands of megawatts of

capacity scheduled to come on-line in 2001 and 2002 may have maintained an adequate balance between supply and demand.

This shortage, however, fails to explain the entire crisis. In a well-functioning, competitive market with fixed capacity, one would expect price spikes when demand reaches system capacity, typically on a hot summer afternoon, but prices should drop during winter months when demand is slack. As Figure 1.1 shows, however, wholesale prices rose to even higher levels in late 2000 just as demand was decreasing. The tight supplies created the conditions for these spikes, but other factors came into play.

#### Bottlenecks in Related Markets

Scarce electricity generating capacity was not the only shortage leading to unprecedented prices for wholesale electricity. Constraints on related infrastructure and markets, including natural gas pipelines, the market for pollution permits, and the electricity transmission system, also drove prices up.

The price of natural gas plays a key role in electricity markets. Because it is relatively clean and inexpensive, it is the fuel of choice for new generation capacity. Virtually all new generation plants burn natural gas, and the proportion of California's in-state production generated with gas plants increased from 23 percent in 1983 to 38 percent in 2000. More important, the costs of gas peaker plants, designed to run only at times of very high demand, often set the market price for electricity because of their relatively high variable costs.

From January through October 2000, an unusually cold winter on the East Coast led to a doubling of the price for natural gas at Henry Hub, Louisiana, considered an indicator of the national price of gas (see Figure 3.9). Because the variable cost of electricity is almost completely determined by gas prices, this increase also doubled generation costs. Even if California's electricity sector had remained completely regulated, the prices of electricity would have increased to reflect these increases in input costs.

Then in November 2000, the California natural gas market was hit with unprecedented volatility. Under normal circumstances, the price differential between the national and the California markets is quite

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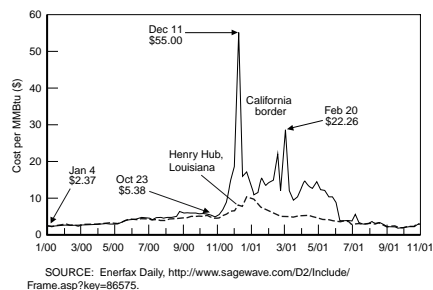


Figure 3.9—Natural Gas Prices, 2000–2001

small, representing the transportation costs from gas fields in the center of the United States to the California border. Yet in November, California prices rose far above the national price, and from November 2000 to June 2001, California natural gas customers were paying two to three times the national price.

As with the run-up in electricity prices, the causes of high gas prices are complex—a combination of unexpected events, demand growth, and market manipulation. An explosion in an El Paso gas pipeline on August 19, 2000, temporarily closed that source of supply, cutting off almost 15 percent of California's pipeline capacity for about ten days and reducing flows for over a year. Normally during the summer and early fall, gas is stored underground in California in preparation for winter heating demand, but this pipeline interruption reduced storage. Storage was further limited by unusually high summer demand for natural gas because of heavy use of gas-fired electricity generators to replace imports of electricity. California entered the winter of 2000–2001 with a shortfall of gas storage equal to two weeks of demand, judging by the average of the three previous years. Then, as shown in Figure 3.10,

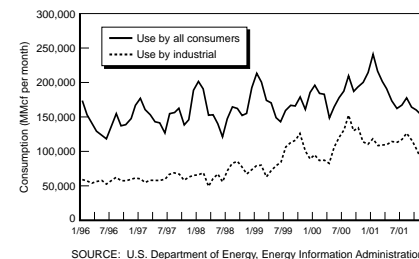


Figure 3.10—California Natural Gas Consumption, January 1996 to October 2001

demand for gas reached all-time highs driven by industrial users including electricity generators.<sup>4</sup>

Under these circumstances—reduced supply and increased demand—an increase in gas prices is to be expected even in fully competitive markets, but these circumstances do not fully account for the much higher rates that California paid in comparison to the rates in the rest of the country. Before the summer of 2000, California had excess gas pipeline capacity. If this capacity was available, higher prices in California should have drawn in additional supplies from the Midwest until the premiums paid by California consumers were reduced.

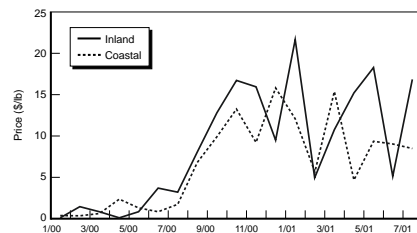
The California Public Utilities Commission among others has charged that the El Paso Corporation strategically manipulated its control of the pipeline to drive up prices. FERC has already found that El Paso entered into an unlawful contract with one of its unregulated affiliated companies to control a significant portion of its pipeline capacity. It is further alleged that El Paso took a number of actions to

<sup>4</sup>A portion of the increase in industrial use, roughly 30,000 MMcf, is due to the transfer of gas-fired generating assets from the utilities to merchant generators.

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reduce the amount of gas transported through the pipeline in an effort to constrain supply, increase prices, and boost the profits earned by its affiliate. This affiliate contract expired at the end of May 2001 and, as seen in Figure 3.9, the premiums paid by California evaporated soon thereafter. FERC has yet to promulgate a final ruling on these allegations, but an August 2002 FERC staff report found preliminary indications that manipulation of gas prices at the California border may have occurred.

During the summer of 2000, the prices for pollution permits also rose precipitously. Under an innovative pollution control system called RECLAIM (Regional Clean Air Incentives Market), industrial plants in the South Coast Air Quality Management District (SCAQMD) that emit nitrous oxides (NOx) must purchase permits for each ton of emissions. The average price of these permits rose from about \$1–\$2 per pound to \$5 per pound in August of 2000, and some transactions were being consummated at prices exceeding \$30 per pound (see Figure 3.11). This increase was caused by a combination of lower availability and higher demand. SCAQMD lowers the number of permits available every



SOURCE: South Coast Air Quality Management District, Regional Clean Air Incentives Market, Trading Bulletin Board.

Figure 3.11—Average Monthly NOx Permit Price for Coastal and Inland Areas, January 2000 to July 2001

year, and 2000 was the first year in which the total number of permits constrained emissions significantly. At the same time, added generation from high-polluting plants that are not normally run for long periods increased demand for permits. Increases in NOx and natural gas prices had a dramatic effect on the marginal cost of electricity generation. Joskow and Kahn (2001b) estimate that these increased input costs raised the marginal cost of a megawatt of electricity from under \$50 in May 2000 to over \$100 in September 2000. Cambridge Energy Research Associates (CERA) estimate the change in marginal costs between December 1999 and December 2000 and find a much larger increase—from the \$19–\$35 range to the \$83–\$521 range.

Limitations of the electrical transmission system also contributed to the crisis. Transmission lines have fixed capacities, at times limiting the ability of energy to be shipped from generating plants to final consumers. One main constraint is Path 15, which connects Northern and Southern California. Congestion on Path 15 can prevent inexpensive power in one part of the state from being shipped to areas being served by more expensive power. This limitation has cost California electricity consumers hundreds of millions of dollars in increased energy costs and has caused rolling blackouts. San Francisco, in particular, has limited connections to the statewide grid because it is situated at the end of a peninsula. Consequently, it is vulnerable to rolling blackouts even when energy is plentiful elsewhere in the state.

These related events demonstrate that California's energy crisis extends beyond the market for wholesale power. California is facing a number of intertwined infrastructure issues. The performance of the electricity sector is dependent on, among other things, gas pipeline and storage systems, the electricity transmission system, and environmental goals. Constraints in any of these systems can dramatically and unexpectedly undermine the performance of interdependent systems, impeding the delivery of energy to California consumers.

#### Wholesale Generator Market Power

The shifts in market fundamentals described above—increased demand and input costs combined with decreased supply—certainly contributed to the increase in wholesale prices, but these factors cannot

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account for the full magnitude of the price spikes that plagued California. The highest profile and most controversial issue of the crisis has been the allegations of market manipulation and price gouging by generating firms. Early in the crisis, California appealed for relief to the Federal Energy Regulatory Commission, which regulates wholesale prices, and is pursuing \$8.9 billion in refunds from energy marketers through a proceeding. More recently, California moved to nullify the long-term contracts entered into with generators during the height of the crisis, arguing that it signed the contracts under duress because of market manipulation, and during the summer of 2002, it renegotiated several of these contracts with the active encouragement of FERC's chief administrative law judge. The attorney general has filed numerous suits alleging monopolistic activities, and the California Senate has been holding months of special hearings investigating market manipulation.

The theory of market power is straightforward. The electricity generation market is dominated by a small number of producers, five national unregulated generation firms and a few public providers such as the Los Angeles Department of Water and Power and the Bonneville Power Authority. In such an oligopolistic market, generators may raise prices above the competitive level (e.g., the industry's cost for the last megawatt of generation produced) by strategically withholding some capacity from the market. When the added revenues from selling electricity at a higher price exceed the lost revenues from not selling all the electricity they could produce, their profits increase. Competition is the main barrier to such exercise of market power. When a generator with unused capacity can profitably undersell the market price, it has incentives to provide more electricity to the market, undercutting other firms' ability to raise prices.

The critical role of competition broke down during the California crisis for a number of reasons. Because of the small number of firms involved in California's energy market, it may have been possible for generators to collude, either tacitly or explicitly, to withhold capacity. Even if each generator would have individually benefited by providing additional supplies to the market, they were jointly better off by agreeing not to compete keenly.

Moreover, electricity markets are particularly prone to the exercise of market power. New supplies cannot be made available quickly because electricity cannot be easily stored, its transportation is limited by the constraints of the transmission grid, and the construction of new capacity entails long lead times. Consequently, generators do not have to worry that new supplies will flow into the market, undercutting their high bids. In addition, demand for electricity is not easily curtailed in the short run because electricity is essential to modern life and because most decisions that determine electricity usage involve the purchase of long-lived appliances (e.g., air conditioners, refrigerators, and heaters). Because demand decreases very little in response to higher prices, even small decreases in supply lead to significant price increases. The increase in price can be so large that a single firm that owns several plants can profit from shutting down one plant. Even if its competitors do not cooperate with this strategic behavior, the lost profits resulting from scaling back production in the one plant can be more than offset by the large price increase received for selling power from their other plants (Borenstein, 2001; Joskow, 2001).

These problems caused by insufficient responsiveness to prices were particularly acute in California. Because AB 1890 had frozen retail rates (and AB 265 refroze them for SDG&E customers), consumers were completely shielded from the increases in wholesale prices as the crisis unfolded. They received no signal or incentives to conserve energy and, consequently, power generators were able to bid even higher prices without losing sales.

Finally, because of the importance of real-time reliability, electricity markets are much more sensitive to the market share of large producers. The largest merchant generator in California, AES Corporation, controls less than 10 percent of the total demand on a hot summer day. In most markets, a similarly sized firm has little ability to increase the market price. In the electricity market, though, that 10 percent market share can represent the critical margin of power required to keep the lights on and air conditioners working on days with tight supplies. Consequently, relatively small firms can exercise great influence on prices if their withdrawal from the market will lead to blackouts.

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Market power has been a pervasive problem in deregulated electricity markets. Numerous analyses have turned up evidence of the exercise of market power in California as well as in other restructured markets (Wolfram, 1999; Borenstein et al., 2001; Bushnell and Saravia, 2002). In a competitive market, economic theory predicts that firms will sell their goods at a price equal to their short-run marginal costs, the variable cost of producing the last unit produced for the market. Unlike other industries in which firms' costs are not publicly available, these costs are known for electricity generators because of the history of rate regulation and ongoing environmental controls. When comparing actual wholesale market prices to competitive benchmark levels, researchers find observed wholesale prices to be persistently higher. In particular, as demand increases and supplies tighten, generating firms have increasing amounts of market power leading to higher markups over competitive price levels (Borenstein et al., 2001; Bushnell and Saravia, 2002). Although the exercise of market power is common, the California market appears to have been particularly susceptible to manipulation. Firms were able to raise prices above competitive levels even when supplies were comparatively plentiful, and the highest markups occurring during times of tight supply endured for much longer periods.

During the worst months of the crisis—November 2000 through May 2001—there is *prima facie* evidence supporting market manipulation by generators. To raise prices generators would have had to withhold capacity from the market, and plant unavailability in California was significantly higher when compared to the number of plants off-line before the crisis (see Figure 3.8). In addition, detailed analyses of the costs of generation, taking into account the increased costs of inputs and market conditions, find that about a third of the price increases experienced during the summer of 2000 can be attributed to market power (Joskow, 2001; Joskow and Kahn, 2001a, 2001b).

This evidence, however, is not incontrovertible, and generating firms and other analysts have offered up a number of alternative reasons that prices may have spiked. The market clearing price is determined by a host of specific market conditions, many of which are not publicly available or easily observable (Harvey and Hogan, 2001). Calculations of the competitive market clearing price under competitive conditions are,

therefore, crude estimates and cannot by themselves show that market prices were higher than generation costs. High prices may also represent scarcity rents. If the electricity system reaches its capacity with no strategic withholding of supply, supply is essentially fixed. Demanders then will bid up to their maximum willingness to pay to gain access to the fixed supply, potentially driving prices far above production costs.

The evidence concerning plant unavailability is also hotly debated. Generators claim that plants were unavailable because of mechanical failures and not strategic behavior. They claim that their plants were run particularly hard during the 1999–2000 winter, leading to additional failures in the following months. FERC did audit plants to see if they were altering their repair schedules to increase prices (Federal Energy Regulatory Commission, 2001). It found no evidence of such efforts to manipulate plant availability, but the study methodology was later criticized in a review by the General Accounting Office (General Accounting Office, 2001). Also, as Figure 3.8 illustrates, the average amount of capacity off-line has actually increased since the crisis abated in June of 2001.

Alternatively, faulty planning by generators may have led to plant unavailability. Certain plants require long lead times to begin operation, and if generators underestimate the demand for the next day, they may be unable to have the plant up and running in time for the market (Harvey and Hogan, 2001). Finally, certain plants were unavailable because of financial and regulatory chaos. When the utilities lost their creditworthiness in January 2001, they halted payments to QFs that supplied thousands of megawatts. Unable to cover their fuel costs, the QFs were forced to halt production and sued to be freed from their contracts with the utilities. Governor Davis resisted releasing the contracts and allowing the QFs to sell their capacity on the higher-priced spot market because this action would have increased the overall costs of electricity purchased by the Department of Water Resources (DWR). This resistance had the effect of taking 2,000 MW of QF production off-line.

Although there is ample evidence indicating that market manipulation did occur, the legal case that merchant generators unlawfully engaged in anticompetitive behavior remains unresolved. FERC, under the Federal

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Power Act, is required to ensure that wholesale generators charge "just and reasonable" prices. During the 1990s, FERC permitted merchant generators to sell their power at competitive rates if they were able to show that the markets in which they operated were reasonably competitive. Although FERC found early in the crisis that wholesale rates were no longer "just and reasonable," it found insufficient evidence to lay the blame on the exercise of market power by generators, and it has yet to decide the extent of refunds, if any, owed California consumers.

The case is complicated by a number of factors. Many of the actions by generators were probably legal, even if they resulted in higher wholesale prices. Even if generator actions were illegal, courts may not intervene because of legal precedents that defer to the rates set by regulatory bodies. Finally, proving market manipulation after the fact places a heavy evidentiary burden on regulatory and enforcement officials. Because of the intricacies of plant operations, it is virtually impossible for an outsider to determine whether a generating plant did not produce electricity for legitimate reasons, such as mechanical breakdowns, or in an effort to increase wholesale prices. Clearly, the California experience has highlighted that identifying and mitigating market power after the fact is politically contentious, administratively burdensome, and legally complex.

#### Regulatory Missteps

The magnitude of the crisis and the extent of its repercussions were certainly exacerbated by a number of regulatory missteps. The design of California's deregulation has received much criticism. Cambridge Energy Research Associates argues that "partial deregulation" based on a "potpourri of competing stakeholder claims" inevitably led to crisis (Cambridge Energy Research Associates, 2001a, pp. 7-8). The Reason Foundation blames the "chaotic implementation" of deregulation (Kiesling, 2001). FERC points out that California accounted for the majority of problems arising from newly deregulated markets and has deemed California's implementation of AB 1890 as "fatally flawed" (Federal Energy Regulatory Agency, 2000). Hogan characterized California's deregulation as "[a] flawed wholesale market and a caricature of a retail electricity market [that arose] . . . as the product of a volatile

combination of bad economic theory and worse political economy practice" (Hogan, 2001b, p. 25). Two problems deserve special attention: the implementation of AB 1890 in which a number of decisions led to excess exposure to spot markets and inaction in the face of the impending crisis.

#### Excessive Exposure to Spot Markets

Although market conditions and market power help explain the extraordinary run-up in electricity prices, they do not in themselves explain the subsequent financial crisis and collapse of the electricity sector. This aspect of the crisis can be explained only by the utilities' excessive exposure to market risk. The retail rates at which the utilities could sell electricity were frozen, but they were forced to buy that same electricity at fluctuating wholesale rates. In the first years of restructuring, average wholesale rates were well below the level of retail rates. Thus, the rate freeze acted as a rate floor, preventing retail rates from dropping to the low levels of wholesale prices and enabling the utilities to earn additional revenues that they applied toward paying off stranded costs. Despite this early fortunate experience, the utilities were operating with the risk that wholesale rates could increase above these fixed retail levels, leading to losses.

Firms that are exposed to volatile commodity prices typically hedge their risks through forward contracts, long-term contracts, or other financial instruments. For example, it is a common practice for newly deregulated utilities that divest some of their generating capacity to sign long-term contracts in which they buy back all or a portion of the power from the new owner (Borenstein, 2001). California utilities did not sign such contracts and, consequently, controlled less than 70 percent of their total energy sales through owned capacity or long-term contracts. Moreover, at times of peak demand, the utilities owned or had under contract only about 18,000 MW of capacity, only 40 percent of their peak loads of 45,000 MW. Consequently, the utilities were dependent

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on the spot market, no matter what price was being charged, for the difference between their own capacity and their customer demands.<sup>5</sup>

If California utilities had tied up more supplies through long-term contracts, the volatility would not have had such devastating repercussions. The enormous increases in their energy purchasing costs would have been mitigated, possibly saving them from financial collapse. More important, greater reliance on long-term contracts would have mitigated the exercise of market power, reducing the degree of price volatility. By shrinking the size of the spot market, long-term contracts decrease the benefits of market manipulation because there are fewer megawatts of power that can be sold at high spot market prices.

Neglecting the critical role that long-term contracts play in a well-functioning electricity market was a major failure of the implementation of California's experiment in deregulation. At the time of restructuring, many industry insiders fully understood that commodity markets are inherently volatile and risky. Failure to hedge against these risks was the equivalent of refusing to buy earthquake insurance in California, but the implementation of electricity deregulation, through a series of seemingly unrelated actions, did exactly that.

AB 1890 was mute on the issue of long-term contracting, neither requiring nor forbidding it. Initially, the CPUC implemented restructuring by requiring that all electricity, utility-owned generation as well as nonutility-owned, be bid through the PX spot market. The utilities soon requested that they be given permission to hedge their positions. In a number of decisions dating back to 1999, the CPUC did slowly and at times reluctantly grant the utilities the authority to hedge. In July 1999, the CPUC allowed utilities to buy block forward contracts through the PX for up to a third of their minimum load. Then in March 2000 the CPUC expanded the amount of energy that could be purchased

<sup>5</sup>In addition, as is explained below, the CPUC required that all electricity, even electricity generated by the utilities themselves, be sold through the PX. Thus, during the height of the crisis, the utilities were buying electricity from themselves at prevailing spot market prices. To the extent that the utility holding companies retained a portion of the revenues from these high-priced sales of electricity, the losses incurred by their utility subsidiaries increased, exacerbating the financial crisis.

through forward contracts, although it retained the right to disallow contract costs (California State Auditor, 2001a, p. 25). In August of 2000, it again expanded the authority to include bilateral contracts. Despite these moves, the utilities remained inadequately protected from price spikes as the crisis broke.

Part of the explanation for this inaction is that the utilities and regulators were focused on other problems. The early years of deregulation were marked by low prices, and the California Energy Commission, as late as February 2000, was predicting decreasing wholesale prices. Consequently, little attention was being devoted to the risks of price spikes. In the early years of restructuring, regulators were also more concerned about the exercise of market power by the three main utilities rather than the new generators. Because the former vertically integrated utilities controlled the distribution system and vast amounts of generating capacity and had strong customer loyalty, the concern was that they would be able to thwart the development of a fully competitive retail electricity market. The requirement that the utilities divest generating capacity and the restrictions on long-term contracting for power were in large part directed at preventing the utilities from dominating the post-restructuring market.

Efforts to recoup stranded costs also diverted the attention of the utilities and regulators. The utilities wished to recoup these costs as quickly as possible, and regulators wished to end the retail price freeze connected to stranded cost recovery so that consumers could take advantage of what seemed like very low wholesale rates. Requiring that the utilities purchase power through the spot market facilitated this process by simplifying the accounting for these payments (California State Auditor, 2001a; Cambridge Energy Research Associates, 2001a).

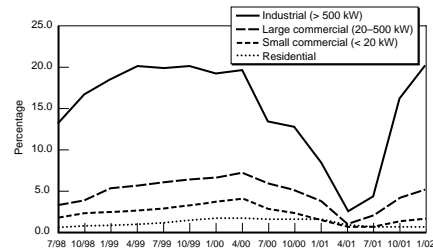
A second reason for the lack of action was that neither the major utilities nor the California Public Utilities Commission appear to have grasped how their roles had radically changed in a deregulated market. Deregulation called for customer choice and competition to determine electricity rates. Utilities have claimed, nevertheless, that they fully expected regulators to allow them to recover the full costs of their wholesale power purchases—an expectation more fitting a regulated firm than a competitive one (Edison International Corporation, 2001). At

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the same time, the California Public Utilities Commission continued to assert the need to review the prudence of the utilities' long-term contracts, ignoring the role that consumer choice and retail competition could play in disciplining bad investments in long-term contracts.

The failure of retail competition to take hold in California further exposed the utilities to unhedged risk. The initial vision of a deregulated market foresaw a market with vibrant competition between numerous retail energy service providers. Within this vision, requiring that the utilities divest all their thermal generating plants and placing restrictions on their long-term contracts was more logical. The new ESPs would need access to wholesale supplies of electricity to serve their customer load, and they were free to use any hedging strategy they found profitable in their wholesale purchases. The utilities, in turn, controlled sufficient generation to serve the customers that remained with them.

Unfortunately, extensive retail competition did not develop. As shown in Figure 3.12, at the height of competitive access in the spring of 2000, about 20 percent of large industrial users, representing over 30



SOURCE: California Public Utilities Commission Direct Access Implementation Activity Reports.

\*Data for April 2000 were unavailable.

Figure 3.12—Percentage of Direct Access Customers per Fiscal Quarter, 1998–2001

percent of industrial demand, had switched away from utility providers. However, fewer than 2 percent of residential customers and fewer than 5 percent of small commercial customers ever switched. In contrast, in other restructured markets, such as that in the United Kingdom, more consumers exercised choice. Since 1999, 17 percent of residential customers there have opted to buy electricity from a nonutility provider.

This anemic record may be attributed to a number of factors. First, consumers, habituated to receiving steady monopoly electricity, tend to take notice of and comprehend new competitive possibilities slowly. When competitive providers broke into the market for long-distance telephone service, for example, it was ten years before 30 percent of long-distance calls were handled by these new entrants, despite the fact that they offered substantially lower prices. The success of residential choice in the United Kingdom may be attributed to the fact that electricity restructuring and choice for larger industrial firms were in place for many years before they were introduced to residential users.

This customer inertia was reinforced by provisions of AB 1890 that were designed to ease the transition to competition. Residential and small commercial customers were given an automatic 10 percent rate decrease and were protected by the rate freeze. These policies dulled incentives to change providers. New entrants found it difficult to undercut the utilities' prices, and competitors could offer few value-added services to small customers to lure them away from the utilities. The one exception was marketers offering "green power" who attracted environmentally conscious users willing to pay a premium over existing rates. Larger industrial customers, in contrast, benefited more from switching. Because they had not received a 10 percent rate cut from the incumbent utility and because they are heavier users of electricity, new entrants could offer more competitive prices and a host of energy-management services.

The effect of the rate freeze imposed on utilities is evident in the pattern of customer choice. As seen in Figure 3.12, beginning in April 2000 as wholesale prices rose precipitously, customers flocked back to the utilities. Consumers, who had not entered into long-term agreements with new providers to lock in electricity rates, saw their bills soar, and they abandoned competitive ESPs to take advantage of frozen default

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rates. Pennsylvania experienced a similar collapse of customer choice when wholesale prices rose above the default rate charged by the incumbent utilities. When wholesale rates dropped to pre-crisis levels, larger customers quickly returned to competitive providers although smaller ones did not react as quickly.

Regulators were also ambivalent about retail competition. The CPUC implemented a consumer education program as mandated by the restructuring legislation, but otherwise maintained a hands-off approach (California State Auditor, 2001a). In particular, the CPUC did not mandate programs that promoted the switching of customers to new ESPs. In Pennsylvania, in contrast, where residential choice had been initially more successful, utilities were required to move some of their customers to competitors. Also, the CPUC failed to aggressively pursue a set of interconnection rules for metering and billing that enabled newcomers to enter profitably.

Failure of retail competition was a problem in its own right. Many of the benefits of restructuring, such as cheaper rates, innovative payment options, and energy-management services, were to arise out of the competitive struggle to attract retail customers. But the failure of retail competition had the more immediate effect of increasing utilities' risk exposure. If ESPs had attracted more customers, the utilities would have had to serve less load, decreasing their reliance on the spot market. The CPUC placed the utilities in this bind by working at cross-purposes. It required the utilities to purchase through the spot market in part to promote retail competition, but then it failed to follow through on promoting competition, leading the utilities to serve a larger than expected load through spot market purchases.

Finally, efforts to promote long-term contracting were stymied by mistrust and poor relations between the CPUC and utilities. Although the CPUC did act to permit greater utility use of hedging instruments, it remained suspicious of long-term contracts. It continued to reserve the right to disallow long-term contract costs in the future if spot market prices were below the contract price, and it was slow to review the contracts that were signed. The utilities, for their part, were hesitant to hedge, either because of their mistrust of the CPUC disallowance or because they were overly optimistic concerning future wholesale prices.

During the summer of 2000, for example, the utilities employed little more than half of the forward contracts they were authorized to purchase (California State Auditor, 2001a, p. 26). These decisions turned out to be quite expensive for both the utilities and California in general.

***Inaction in the Face of the Impending Crisis***

The lack of a rapid, decisive, and coherent response by policymakers also contributed to the devastating consequences of the crisis. The problems with the electricity sector became widely evident in June of 2000 as wholesale prices soared above \$100 per MW. The utilities were forced to buy expensive wholesale power and sell it for low retail rates, and their debts mounted rapidly, as much as \$50 million per day. The dangers of default by the utilities, widespread chaos, and rolling blackouts loomed large.

During the rest of that year, however, California and federal regulators took only limited actions to address the fundamental problems driving the crisis. In December, FERC issued an order with a set of ultimately ineffective market mitigation measures. In the order, FERC made it clear that it believed that California bore the ultimate responsibility to address the crisis. California took a number of actions. During the summer of 2000, the ISO became concerned about increasingly tight supplies and initiated a program to contract for 3,000 MW of additional peaker plants that could be brought on-line for the summer of 2001 (California State Auditor, 2001b). With AB 265, the legislature reimposed a rate freeze on SDG&E to shield consumers from a run-up in wholesale prices. It also enacted a number of measures to increase supply through the expedited approval of generating capacity and to decrease demand through conservation efforts.

These programs met with moderate success. The ISO was able to contract for 1,324 MW of capacity, although it still required CEC approval for the plants. Expedited review did lead to about 400 MW of peaker capacity being brought on-line during the summer of 2001, and the various conservation programs led to larger-than-expected reductions in demand during 2001. Nevertheless, these efforts failed to avert the financial and institutional cataclysm that hit the California market in January 2001.

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More decisive action was gravely complicated by the division of regulatory authority between the state, which regulated retail rates, and FERC, which regulated wholesale rates. Avoiding the imminent financial collapse of the utilities required raising retail prices, placing controls on wholesale prices, or a combination of the two. The political and economic situation at the height of the crisis was complex and full of uncertainty, leading to pitched debate over the correct course of action. There were several competing diagnoses of the fundamental causes of the crisis. These included, among other things, the exercise of market power, a poorly designed deregulatory structure, higher production costs, and scarcity of electricity. Each of these causes led to different policy solutions. To the extent that the crisis reflected higher production costs, and scarcity, price increases were warranted. In contrast, to the degree that high wholesale prices reflected the exercise of market power, price increases would simply ratify the distortions that arose because of that market power, while not solving the underlying problem.<sup>6</sup> Rather, market power called for price caps or other methods of mitigating the exercise of market power.

California politicians and regulators, being closer to California consumers, wished to avoid price increases for their constituents, as evidenced by their support of AB 265. These proclivities were likely reinforced by the extended presidential election in November 2000 as politicians wished to avoid becoming mired in crisis when political advancement in the next administration remained possible. Correctly or incorrectly, they believed that the behavior of the wholesale market was not purely the result of competitive market forces, supporting their decision to maintain retail price controls. They would certainly have reinstituted wholesale price controls if they had had the authority to do so.

FERC, in stark contrast, through its efforts to liberalize electricity markets throughout the United States, was more closely aligned with the power generators with whom it shared pro-restructuring positions. It

<sup>6</sup>Increased prices would mitigate the exercise of market power by increasing demand responsiveness, but they would not prevent generators from earning monopoly profits.

advocated strongly that the crisis was not due to the exercise of market power. Interventions in the market would, in its view, risk further damaging the market and impeding the investments in new capacity required to alleviate the crisis in the long run.

Resolving these issues of cause and appropriate policy response would be difficult under any circumstances. Here, the crisis atmosphere, combined with strong ideological differences and mutual mistrust and recrimination between FERC and California, prevented the two from working in concert. Earlier unilateral action by either party—a price increase by California or the imposition of wholesale price caps by FERC—was unlikely because it undermined each party's political and ideological position.

In retrospect, a well-designed combination of increased prices and short-term price controls on wholesale prices implemented in 2000 could have avoided much of the damage of this crisis. They would have protected the utilities from fiscal collapse by simultaneously increasing their revenues and decreasing their costs. Retail price increases would have addressed the fundamental capacity shortage by signaling the need for conservation, and wholesale price caps may have reduced the exercise of market power. Wholesale price controls would have made retail price increases more politically acceptable and retail price increases would have signaled to generators that California wished to maintain a healthy investment environment.

In the end, both California regulators and FERC relented, adopting policies along the lines of this compromise. The CPUC ratified two price increases of historic proportions, one of 10 percent in January and a second larger increase averaging 46 percent in March. At the federal level, the politics surrounding energy regulation changed dramatically during the spring of 2001. President Bush appointed two new members to the Federal Energy Regulatory Commission, and the Democratic Party gained control of the Senate, leading to renewed calls for action. Consequently, FERC switched its antiregulatory stance and imposed effective regional price caps on June 19, 2001. Unfortunately, by the time these policies took effect the damage had been done.

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#### Faulty Market Design

The disastrous performance of the California market has also been linked to the structure of its market institutions. The design of well-functioning electricity markets is intricately complex. Design must incorporate elements of regulation, coordination, and competition. Auctions for power must be designed to provide incentives for least-cost dispatch of power, for the expansion of generation and transmission capacity when needed, and for mitigating the potential abuse of market power. The entire system must be coordinated to control for the externalities of network operations and the need to maintain system balance in real time. The details of market design are critical and getting them wrong can lead to perverse actions by market participants. It is common for deregulated markets to require amendment as design issues arise (Hogan, 2001b).

Several specific deficiencies with the California example have been identified. The overall design was complex, relying much more on market forces than other examples of deregulation. Joskow has characterized it as "the most complicated set of wholesale electricity market institutions ever created on earth and with which there was no real-world experience" (2001, p. 14). During the implementation of AB 1890, energy traders, generators, and other interests bargained over rules paying closer attention to their interests than to efficient and effective market design. In the end, the rules were opaque to all but industry insiders.

An example of this complexity was the separation of the PX, which conducted day-ahead auctions for power, from the ISO that runs the transmission grid and purchases power in real time. This bifurcation of responsibility created incentives to move transactions from the day-ahead market to the real-time market where competition is attenuated because of the exigencies of maintaining system balance (California State Auditor, 2001a; Hogan, 2001a). These bidding strategies complicated the administration of the grid and raised wholesale prices.

Hogan also criticizes the market structure for lacking sufficient pricing zones. Network congestion can cause the market-clearing price

to differ from location to location because inexpensive power is unable to flow to areas being served by more expensive generators. California had only a two-zone congestion system that failed to track congestion within each zone. Consequently, price signals for efficient dispatch of generation and for investments in needed additions to transmission capacity were not being properly generated by the market (Hogan, 2001a, p. 27). Revelations of Enron trading strategies have highlighted how faulty market design left the transmission market vulnerable to manipulation. In one strategy, for example, Enron played California's market against regulated transmission in neighboring states. It would claim to ship energy through California counter to the direction of congestion, thereby collecting payments for congestion relief. It would then sell that power back to the original location through regulated transmission in neighboring states. No net energy was moved or congestion relieved, but Enron profited from the spread between California congestion payments and tariffed transmission charges. These problems are particularly important given that transmission bottlenecks have been a major source of concern during the crisis, and additional transmission will be required to improve the operation of the California electricity system.

These market design issues were probably not fundamental factors in the California crisis, certainly not in comparison to the supply shortage and the exposure to the spot market. As Harvey and Hogan admit, "the conditions were so extreme in California that even a good market design may not have survived the summer of 2000 and its aftermath" (Harvey and Hogan, p. 28). Nevertheless, the future of the California experiment in deregulation will depend on getting the details of market design correct.

#### Conclusion

The tidal wave that struck California's electricity sector from the summer of 2000 through the spring of 2001 was due to a specific combination of factors that befell California. Some common simplifying myths concerning the origins of the crisis do not stand up to scrutiny. It was not due to explosive demand growth in California. Demand was growing more slowly than it had in the 1980s and much more slowly

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than in neighboring states. Also, it was not caused by rampant "NIMBYism" preventing construction of new generating plants. The regulatory review process slowed plant construction, but new plants were being sited, funded, and built.

Among the remaining factors, no single one fully explains the crisis. The fault cannot be pinned entirely on the shortage in generating capacity. Other states, such as New York, have experienced shortages without catastrophic consequences, and even in California, the worst of the crisis occurred during the winter of 2000–2001, when demand was low. Similarly, market manipulation by generators does not tell the whole story. There is strong evidence of the exercise of market power, but even if wholesale markets had been perfectly competitive, wholesale prices would have increased because of increases in input prices. In addition, blaming market players does not explain why they did not flex their market power to the same degree before May 2000 and after June 2001. The flaws in the restructuring of the electricity sector cannot account for everything. The market, after all, worked reasonably well for the first two years of its operations, and many of the features that have been criticized, such as the retail price freeze, are common to other restructured markets that have performed better.

Although the division of regulatory authority between California and FERC led to catastrophic policy paralysis in response to the crisis, it cannot be blamed for the run-up in wholesale rates that instigated the crisis. Finally, inadequacies in the design of market institutions created greater opportunities for manipulation and impeded coordinated responses to emergency conditions, but such problems were not unique to California. The design of electricity markets is complex, and all efforts at restructuring have encountered unforeseen difficulties, requiring midcourse corrections.

Given the uniqueness of California's experience and the large number of factors at play, it is not possible to fully disentangle the unique contribution of each factor and the interactions between them that led to blackouts, major financial crisis, and the systemic breakdown of market institutions. Some important conclusions can be offered nevertheless.

First, California's electricity sector was rocked by a number of factors unrelated to restructuring: the rise in national natural gas prices, higher costs for pollution permits, and a drought in the Northwest that reduced available imports of electricity. Even if the electricity sector had remained regulated, prices would have increased, and some blackouts would possibly have occurred between May 2000 and June 2001.

Second, market and regulatory conditions aligned, making a particularly ripe environment for the exercise of market power. The shortages in generating capacity played a critical role, increasing the bargaining strength of merchant generators and signaling the enormous profits that could be gained through supply shortages. At the same time, the excessive reliance on the spot market, constraints on transmission capacity, features of the market structure, and the division of regulatory authority all increased the opportunities and incentives for strategic manipulation of the markets.

Third, the exercise of market power fed back to exacerbate underlying problems. It increased the severity of shortages and appeared to interact with the natural gas market, driving up prices to unprecedented levels.

Fourth, increasing wholesale prices combined with the perilous risk exposure of the utilities to create a full-blown financial fiasco.

Finally, the division in regulatory authority and market structure impeded policymakers from developing a rapid, coordinated, and effective response before major damage was inflicted on the electricity sector, the California economy, and all Californians.

An important lesson from the crisis is that electricity systems are complex, interdependent systems. Decisions concerning generation, transmission, distribution, the delivery of energy sources such as gas, and consumption must be coordinated in real time at all times under tight constraints of reliability. The state of competition, market rules, and regulatory oversight interact in multiple and complex ways to coordinate actors, control market power, elicit investments, and send signals to consumers. Changes in certain elements of the system can have profound effects on other elements. Consequently, policymakers must be cautious in dealing with reforms in a piecemeal fashion.

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### Addendum: The Crisis Fades

Unexpectedly, the summer of 2001 saw the crisis begin to abate. Late in the spring, experts were still predicting ever-higher prices and days of rolling blackouts (Vogel, 2001). Instead, no blackouts occurred and wholesale prices tumbled to their precrisis levels. Although the end of the crisis was unexpected, the underlying reasons for this turn of events are not surprising. Several trends that caused the crisis in the first place were reversed.

The supply shortage abated as movements in both supply and demand brought them more into balance. Available capacity increased for a number of reasons. Over 2,000 MW of additional capacity was brought on-line. Of this capacity, 634 MW had been rushed to market through the emergency fast track regulatory approval process established by Governor Davis, but most of it had been in the pipeline before the beginning of the crisis (California Energy Commission, 2002b). In addition, the amount of unscheduled outages of generating plants plummeted (see Figure 3.8).

These shifts were complemented by lower electricity demand. Even though the summer of 2001 was on average hotter than the summer of 2000, electricity demand decreased noticeably, topping out with an 8.4 percent decrease in June (see Figures 3.13 and 3.14). These conservation efforts were not directly a response to increased retail prices given that they preceded the steep increases that took effect in June. A number of targeted demand-reduction programs, however, offered compensation for reduced usage. For example, the 20/20 program offered consumers a 20 percent rebate on their summer 2001 electricity bill if they reduced their usage by 20 percent. These programs combined with heightened public awareness of the crisis and public appeals for conservation played significant roles in reducing consumption. In addition, price increases for natural gas over the winter, which many consumers confused with increased electricity prices, and a slowing economy appear to have contributed toward curbing demand.

Tight conditions in the markets for inputs for electricity also abated. The price of natural gas tumbled to the single-digit range (see Figure

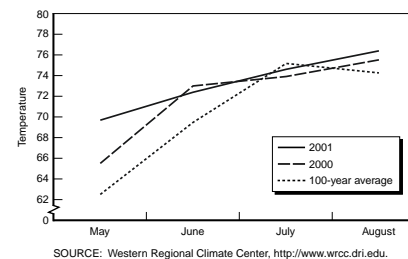


Figure 3.13—California Summer Temperatures, 2000, 2001, and 100-Year Average

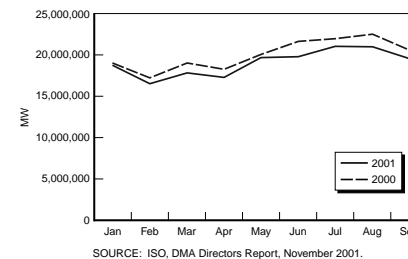


Figure 3.14—Weather Adjusted Loads, January–September 2000 and 2001

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3.9). Electricity generating plants were removed from RECLAIM's NOx trading system and were charged a flat rate for each pound of emissions. These shifts reduced the costs of generation and helped drive wholesale prices down.

Actions taken by policymakers also helped. The price increases implemented by the CPUC not only contributed toward curbing demand, they mitigated the financial turmoil enveloping the electricity sector. It also appears that policy actions that reduced generators' incentives to strategically withhold power decreased the exercise of market power during the summer. First, FERC implemented a strict, regionwide cap on wholesale rates in June, limiting the ability of generators to increase market prices. Second, the Department of Water Resources locked up a large portion of California's energy needs in long-term contracts, thereby reducing the size of the spot market. The decrease in the number of plant outages seems to indicate that these actions were successful.

Since the summer of 2001, the California energy sector has hobbled forward in a muddled, though stable, state. Spot market prices have moderated considerably, hovering near their precrisis levels. Unfortunately, consumers are not benefiting much from these dramatically lower prices, because most power is procured through the long-term contracts signed by the state, leaving only marginal amounts to be bought through the spot market. Hot spells during the summer months of 2002 have shown that California is not yet completely out of the woods. Spot market prices have at times bumped up close to FERC's current \$91.87 price cap, and the ISO has declared some emergency notices as reserves have dipped low. The system has held up, nevertheless, and no rolling blackouts have been necessary. The grid has been strengthened by continued additions to generating capacity. Since the beginning of 2001, over 10,000 MW of capacity have been brought on-line or are nearing completion. Nevertheless, the long-run adequacy of California generating plant remains a concern. In reaction to plunging wholesale prices, power producers have either cancelled or delayed almost 5,000 MW of planned construction.

Investigations and court suits concerning allegations of market manipulation have dragged on with no sight of an early conclusion. The

most prominent revelation has been the Enron memo detailing the trading schemes it employed to manipulate design flaws in the California market. These schemes focused on ancillary markets that are much smaller than the main market for wholesale power, and they were not responsible for the overwhelming problems faced by California. Despite providing no smoking gun for the more fundamental allegations of market manipulation, the memo has given credibility to the charges and has prompted much closer scrutiny to the practices of energy traders.

California, however, cannot allow its electricity management to continue to drift, as significant challenges lie ahead. FERC's market mitigation measures expired at the end of September 2002. It declared its intention to replace the current price cap formula with a straight \$250 per MW cap, and California regulators fear that this increased level may reopen the market to manipulation. Also, the state's authorization to purchase power expires at the end of the year, requiring that the three main utilities resume their traditional role of purchasing power for their customers. Most important, California continues to lack a clear direction out from the crisis. The next chapter reviews options for moving forward, and Chapter 5 examines three specific recommendations for improving the performance of the electricity sector.

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#### 4. Rebuilding the California Electricity Sector: Institutional Choices

To this point in the California electricity crisis, policy action has focused on the financial dimensions of the crisis: paying for very high-cost wholesale power, rescuing the utilities from insolvency, seeking refunds for unjust and unreasonable wholesale rates, and financing the state's \$42 billion in long-term contracts. These problems remain unresolved and must be addressed before progress on longer-term issues can be made.<sup>1</sup> As these financial problems are addressed, long-run, institutional issues will become prominent.

The electricity crisis shattered the main structures of California's restructured market. The PX went out of business, competitive electricity retailers disappeared, the state replaced the utilities as the main purchaser of wholesale power, and the independent, stakeholder board of the ISO was replaced by a board appointed by Governor Davis. A host of new state and federal regulations were enacted in a frenzied response

<sup>1</sup>The Department of Water Resources authority to purchase electricity expires at the end of 2002. At that time, the utilities must be financially able to resume their role of purchasing power for their customers. SCE and SDG&E are well along toward recovery. The fate of PG&E, in contrast, remains less certain, hinging on the decisions of the bankruptcy court. PG&E and the CPUC have offered competing plans for resolving creditors' claims, and decisions could lead to protracted legal wrangling. The DWR's purchasing authority may need to be extended for a short period, but the additional purchases necessary would be small because the state has already locked up most power needs with its long-run contracts.

Settling the payments for the expensive long-run contracts has been more contentious. It has already led to a prolonged dispute between the CPUC and the DWR over ratemaking authority and to the curtailment of retail choice. A bond issue to repay the general fund for power purchases was repeatedly delayed because of these disputes. Continued battles attempting to shift these costs to different groups of ratepayers and taxpayers can be expected.

to the crisis, and confidence in electricity markets was battered by the crisis and subsequent revelations of market gaming by energy traders. This list could be extended.

Policy makers face numerous fundamental questions as to how to repair and replace these fractured structures. How will the electricity sector be organized? What segments of the industry, if any, should be open to competition? What rules will dictate the competitive process? What role should the state take on as regulator, planner, and direct participant in the electricity sector? What role should the various state agencies play? Although significantly less attention has been given to these concerns, how they are resolved will determine whether the crisis becomes a long-term drag on California's economy or whether California can put the crisis behind it and build a healthy electricity sector that can fuel future economic growth.

Decisions over the long-run institutional structure of California's electricity sector are complicated by the complexity of the issues that the crisis unearthed and the wide range of options being debated. Serious proposals representing almost the entire spectrum of economic philosophies are receiving significant attention. These include calls for increased public ownership of the electricity sector, a return to the system of cost-of-service regulation that preceded California's experiment with markets, continuing with market reforms by repairing market mechanisms and reinstituting customer choice, and hybrids that combine elements of two or more of these options. These alternatives propose starkly different approaches to the interrelated problems identified above—shortages in generating capacity, the exercise of market power, and weaknesses in regulatory and market institutions.

Assessing the relative performance of these disparate alternatives poses significant analytical challenges. The policy sciences have a number of theories that detail potential government failures in this area. Government-owned and government-regulated industries tend to face dull and at times perverse incentives that limit their ability to use resources efficiently. For example, government bureaus are often internally motivated to increase their size and scope in an effort to increase their organizational prestige and influence, but these internal incentives unchecked by competition may run counter to the interests of

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the customers they serve. A large literature on the regulation of industry has also shown that regulatory agencies tend to be captured by the industries they are intended to regulate, serving their interests instead of the interests of consumers. In addition, regulatory powers are often used to advance narrow political goals by rewarding certain consumer groups at the expense of others.

Similarly, the policy sciences have developed a refined understanding of market failures. These include the dangers of market power when there is insufficient competition between suppliers; the costs of externalities, such as environmental damage, that are not accounted for in market transactions; and the difficulties of coordinating complex activities in real time through market-like processes.

Despite these important insights, the policy sciences have made much less headway in their ability to assess the *relative* costs of government failures versus market failures in complex situations. In the electricity sector, for example, experience has shown that both government failures and market failures are manifest. Consequently, measuring the performance differences among imperfect government ownership, imperfect regulation of private monopolies, and imperfect market competition is difficult, tradeoffs are harder to assess, and conclusions are ambiguous. As a result, the debate over institutional alternatives is often driven more by ideological predispositions than by hard evidence. Proposals often focus on isolated facets of the electricity sector and leave their normative motivations implicit, muddying the differences between proposals.

To focus and clarify our analysis, we begin by enumerating six basic goals for a well-designed electricity system. A clear set of goals provides a more consistent basis for the comparison of alternatives, helps distinguish between what is known and what remains ambiguous, and aids in identifying the tradeoffs posed by these alternatives. This chapter then applies these goals to understand the broad institutional choices facing policymakers.

#### Goals for the Electricity Sector

A well-designed electricity sector, whether competitive, regulated, or some form of hybrid, should seek to achieve six goals:

- **Low prices.** The quest to lower electricity rates had been a significant, if not the primary, motivation behind restructuring. Because electricity is a necessary input to almost all aspects of a modern economy, lower prices improve the economic competitiveness of California businesses and benefit California consumers.
- **Bill stability.** Because most consumers cannot easily change their consumption habits in the short run, they seek to avoid spikes in prices. Firms, for example, typically enter into long-term contracts for commodities that provided relatively predictable charges over time. Bill stability is not the same goal as price stability. Prices may be allowed to fluctuate in accordance with short-run market conditions while average monthly bills remain relatively constant (Friedman and Weare, 1993; Borenstein, 2001).
- **Efficient resource use.** Production efficiency requires that all electricity plants be run optimally, that lower-cost sources of electricity be employed before higher-cost sources, and that over time investments in capacity track trends in demand. Consumption efficiency requires that electricity be employed in its most valued uses and that it be conserved whenever the cost of electricity exceeds either the benefits derived from electricity or the costs of efficiency-enhancing investments.
- **System reliability.** Given the high costs of blackouts, at least for the majority of consumers, the reliability of the electricity system has been a major concern. One-hundred percent reliability for all customers at all times, however, is not the ultimate goal. Certain customers place a lower value on an uninterrupted supply, and they can be provided with interruptible contracts while preserving a reliable supply for the majority of users.
- **Administrative feasibility.** Regulatory and market institutions must provide producers and consumers with clear and stable rules that establish incentives and opportunities for economically rational actions. These institutions must possess the authority and ability to perform assigned tasks. At the same time, these agencies must be sufficiently flexible to react to changing

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circumstances as the electricity sector continues to evolve rapidly.

- **Environmental protections.** All these goals also need to be achieved within the constraints of preserving clean air and clean water and protecting key environmental resources.

These goals, of course, involve tradeoffs. Maintaining low prices may harm system reliability by decreasing incentives for investments in generating capacity and may impede conservation efforts by reducing the incentives to manage consumption. Some policies aimed at enhancing the efficient use of resources can be complex, straining administrative feasibility. Maintaining system reliability may require additional generation plants that cause environmental damage. Providing consumers with stable bills may impede the efficient use of resources by dampening the incentives faced by producers and consumers. Alternatives differ not only in how well they achieve these six goals but also in the tradeoffs between goals they entail.

#### Public Power

Advocates of the public ownership of the electricity system received a boost from the California electricity crisis. Municipal utilities, especially those that owned generating capacity such as the Los Angeles Department of Water and Power and the Sacramento Municipal Utility District, weathered the crisis in excellent shape. Since the beginning of the crisis, a variety of proposals to increase public control have been floated. The creation of the California Consumer Power and Conservation Financing Authority (CPA) is the most prominent effort, but it is only one of many. In early efforts to rescue the utilities from insolvency, the state considered buying their transmission assets. More recently, Assemblyman Keeley has floated the idea of buying out PG&E and running it as a public service corporation. Municipalities have also shown great interest in assuming a role in electricity provision. This trend is highlighted by the recent vote in San Francisco that narrowly failed to create a new municipal power authority.

Public power already plays a substantial role in the electricity sector. More than a fifth of all power in the United States is provided by public

entities. The Energy Information Administration reports that 8.2 percent is produced by the federal government and 14.7 percent is produced by publicly owned utilities and cooperatives. In California, the proportion is even higher, with about 25 percent of power coming from municipal utilities and cooperatives.

Because public utilities have operated alongside regulated, private utilities for many years, there has been extensive research comparing their performance. The data comparing both public and private, regulated utilities with competitive utilities are sparser because restructured electricity markets are relatively new. There are reasons to expect that ownership would lead to different outcomes because public versus private utilities face divergent incentives, opportunities, and constraints. Private utilities face stronger incentives to economize because private owners capture the benefits of costs savings and innovation. These incentives, however, are dulled by regulation, and the benefits of economizing can be dissipated if regulators are captured by the utilities they are intended to regulate. Public ownership, in contrast, avoids the informational costs associated with regulation, but at the same time introduces potential inefficiencies because of the constraints of managing within a bureaucracy and the lack of strong incentives to economize.

Despite these differences, comparisons between the costs of public and private, regulated utilities do not establish an overwhelming advantage for either form of ownership. As shown in Table 4.1, during the 1990s in California, the average cost of municipal power was about 13 percent lower than the average of the three utilities, 8.29 compared to 9.53 cents per kWh for the three major utilities. Much of this difference, however, is due to specific advantages provided to municipal utilities that are not available to investor-owned utilities. The municipal utilities are granted access to low-cost hydro generation from federal projects, are exempt from state and federal taxes, and are 100 percent debt financed, which is less expensive than financing with a mix of debt and equities. In addition, the cost performance of municipal utilities in California is highly variable, indicating that government ownership by no means ensures lower overall costs.

More comprehensive analyses of the relative performance of public and private utilities also arrive at mixed results, although they provide

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Table 4.1  
System Average Rates (cents/kWh)

	Average, 1990–1999	Standard Deviation, 1990–1999	Standard Deviation Rank
Merced Irrigation District	1.41	0.433	5
City of Vernon	5.68	0.885	18
Santa Clara Municipal Electric Department	5.83	2.382	24
City of Palo Alto	6.13	0.932	20
Modesto Irrigation District	6.31	0.565	9
City of Redding	6.35	0.657	12
Turlock Irrigation District	7.08	0.609	10
Sacramento Municipal Utility District	7.51	0.248	2
Imperial Irrigation District	7.71	0.823	17
Roseville Electric Department	7.97	0.242	1
City of Azusa	8.06	1.697	23
City of Anaheim	8.53	0.735	13
Los Angeles Department of Water & Power	8.69	0.421	4
City of Glendale	8.76	0.781	16
Colton Electric Utility Department	8.88	1.461	22
City of Pasadena	8.93	0.774	15
San Diego Gas & Electric	9.04	0.453	6
Burbank Public Service Department	9.19	0.609	11
City of Lodi	9.39	0.895	19
City of Alameda	9.60	0.773	14
Pacific Gas & Electric	9.75	0.517	8
Southern California Edison	9.79	0.407	3
City of Riverside	9.86	0.501	7
Lassen Municipal Utility District	10.23	1.150	21
Average of three private utilities	9.53		
Average of municipal utilities	8.29		

SOURCE: Bay Area Economic Forum (2001c).

some support for a small cost advantage for public utilities. A recent survey found six studies that concluded that public electricity providers had lower costs than private, regulated utilities; five studies that found no difference; and two studies that found that private, regulated provision led to lower costs (Kumbhakar and Hjalmarrson, 1998). Another recent study echoed these conflicting findings, concluding that public utilities have lower overall costs even accounting for public subsidies but that private utilities are more efficient at generation (Kwoka, 1996). The same study also found that public utilities tended to have slightly lower

rates for residential customers balanced by slightly higher rates for commercial and industrial customers, indicating that public managers do exercise discretion in rate decisions.

Public utilities in California, however, have not provided their customers with particularly stable rates. The standard deviation of rates—a measure of variability over time—for the private utilities are among the lowest, and public utilities, such as Burbank, Lodi, and Alameda, that have average rates similar to private utilities have much more variable rates. Most likely, public utilities are more vulnerable to external shocks such as changes in fuel prices or interest rates because they are smaller than the private ones.

Concerning reliability and environmental effects, public ownership can have positive attributes. Public providers may be better prepared to invest in expanded capacity as demand increases because they are insulated from the vicissitudes of financial markets and strict profit constraints. Freedom from the need to maximize profits also enables public utilities to pursue environmental goals. For example, the California Power Authority has decided to focus its investment portfolio on green power sources. There is no strong evidence, however, indicating that public providers are able to deliver these benefits in practice.

In a transition to increasing the role of public power in California, policymakers would have to navigate several hurdles. A number of changes in the power industry make it increasingly difficult for public utilities to provide power on more favorable terms than private utilities, especially if they must shoulder a portion of the added costs of the state's long-term power contracts. New public providers are unlikely to gain access to cheap federal power, forcing them to either construct new generation plants or buy electricity on the open market. Regulatory rules governing access to tax-exempt bonds are in flux and could increase the financing costs faced by new public utilities.

In areas that are currently being served by private utilities, municipalization efforts face stiff resistance from the incumbents who wish to maintain their customer base. Acquisition of utility assets typically entails a long political and legal battle, demanding a high degree of perseverance on the part of policymakers. Most important, the value

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of the assets must be negotiated. Recently, electricity system assets have been trading at above book value (e.g., original cost minus accumulated depreciation), and as this premium above book increases it becomes increasingly difficult for a new public power provider to offer attractively priced electricity.

#### Return to Regulation

A return to a fully regulated industry remains a possibility and has a number of influential advocates within regulatory agencies and the legislature. In April 2002, the Public Utilities Commission reimposed cost-of-service regulation on the three main utilities, although this ruling applies only to the assets that they continue to control. This action could be a temporary stopgap until other policies are formulated or it could be the first step in reconstituting the old regulatory regime. Beyond California, the situation is in flux. FERC, some states, and some foreign countries continue to pursue electricity sector restructuring aggressively. Nevertheless, the majority of states still have not restructured, and a number have backed off or slowed down their reform efforts since the California crisis.

The main benefits of the regulated regime were that it provided a high degree of system reliability and bill stability. Regulated utilities had the obligation to plan and construct capacity to service all ratepayers in their regions. The CPUC in turn set rates that allowed them to earn a fair return on all capital investments that were used and useful. This regulatory compact had a long and successful record in stimulating investments to meet growing electricity demand, and with cost-based rates it protected consumers from dramatic changes in their bills. The California electricity shortage of 1948, however, is an important reminder that regulated systems are not immune from short-term energy crises. The sets of rules and procedures that had been developed over time provided a transparent, well-understood, and administratively manageable process for regulatory decisionmaking. More recently, a number of successful conservation programs were implemented that encouraged regulated utilities to search out and invest in conservation.

The regulated regime, nevertheless, suffered from distinct and well-known disadvantages. Although regulated utilities had historically

provided fairly low-cost electricity, the high rates paid by California consumers before restructuring clearly demonstrate that regulation does not ensure low rates. Utilities operating under cost-of-service regulation are guaranteed to recoup their reasonable expenses plus a reasonable profit on prudent investments. In practice, standards of reasonableness and prudence leave great discretion with the utilities. Consequently, they are at best weakly constrained to operate efficiently, innovate, and develop the lowest-cost portfolio of generation and other assets. The obligation to serve, in addition, creates a bias toward excess capacity, which was one of the root causes of the high rates experienced in California in the early 1990s.

Historically, regulators have failed to provide consumers with price signals that reflect the underlying costs of the electricity they consume. They tended to charge consumers the average cost of all electricity produced. Thus, prices were high when a system had an overabundance of capacity driving up average costs, and prices were low when there was too little capacity and overall costs were lower. As a result, consumers received perverse incentives. When supplies were tight making conservation necessary, prices were low, encouraging greater use. When supplies were abundant the exact opposite occurred. Instead of setting low prices to encourage consumers to take advantage of the available power, regulators set prices high. California's deregulatory experience repeated this trend. Price freezes prevented retail rates from jumping as shortages led to wholesale price increases in 2000 and early 2001. Now, as the shortage has waned, helping wholesale rates decrease substantially, consumers are paying about 50 percent higher rates since the two rate increases implemented in 2001.

Regulators can mitigate these regulatory constraints. Strict cost-of-service regulation can be replaced by performance-based regulatory regimes. These regimes provide utilities greater incentives to operate efficiently by allowing them to retain a portion of the costs savings from their actions. Ratemaking can also be reformed to provide consumers better incentives by aligning rates more closely with the real costs of producing electricity (e.g., the short-run marginal cost) or by real-time pricing (RTP), which is discussed in greater detail below. Although there has been some experimentation with these reforms, regulators have been

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slow to adopt them, largely because they impair the transparency of traditional cost-of-service regulation and because they fear that certain customer groups may be harmed by changes in ratemaking procedures.

It may be impossible, or at a minimum politically difficult, to put the genie back into the bottle and return completely to the prerestructuring environment dominated by three vertically integrated utilities. A move to return the generation capacity sold off to merchant generators during restructuring to the utilities would be resisted by both the merchant generators and the utilities that are working to move away from their regulated businesses.

A return to a more regulated regime, however, could be achieved without disturbing the current ownership of generation capacity. Retail regulation could be retained while mandating that the utilities procure additional energy through long-term contracts. Regulation of energy procured through long-term contracts is not new. Even in 1995, California utilities generated only about 58 percent of the power while they served three-quarters of the load, indicating that much of their power was purchased from third parties, mostly QFs or imports. Regulators can simply build on this model.

Determining the reasonable and prudent costs of a portfolio of long-term contracts does pose difficulties. If utilities are not exposed to retail competition, regulators cannot eliminate all prudence reviews. In that case, utilities retain market power over their captured customers and have obvious opportunities for self-dealing or signing sweetheart contracts at above-market rates.

At the same time, strict prudence guidelines that view with suspicion all long-term contracts struck at prices above realized spot market prices place an unrealistic burden on utilities. Utilities develop a portfolio of forward and spot market power in an environment of great uncertainty over future market trends. They base their decisions on their expectations of future prices and their need to hedge risks, but as spot and forward prices for electricity vary over time, decisions that appeared reasonable *ex ante* may appear less so after the fact. Although forward contract prices should roughly track spot market prices *on average*, one must expect that forward contracts, entered into reasonably and prudently, will at times be priced below the spot market price and at

other times be priced above. The mere fact that forward contracts are above spot market prices at a particular time, therefore, does not indicate that they were imprudent.

The degree of prudence review to apply to such a portfolio was a major bone of contention between the utilities and regulators leading up to the crisis. The fact that they were unable to resolve these disagreements was a major contributor to the crisis and cautions about the administrative feasibility of regulating such contracts. A return to a more regulated regime, consequently, would require that regulators and utilities strike a compromise. Regulators must maintain a level of review that guards against opportunistic behavior, but such prudence review must be sufficiently limited in scope as to provide utilities with sufficient predictability that they will enter into long-term contracts.

#### Fix Markets and Proceed with Restructuring

The third institutional option open to decisionmakers is to continue with the restructured electricity market while correcting those components of its design and implementation that led to the crisis. This option receives strongest support from economists and business interests. It also best accords with the policy direction of the Federal Energy Regulatory Commission as it works to establish regional electricity markets in the United States. In the long run, this path presents the largest potential benefits in terms of greater efficiencies and lower prices for consumers. At this time, when California consumers and businesses face extraordinarily high electricity rates for many years to come, the benefits from wringing additional efficiencies are more important than ever. This avenue, however, also poses the most unknowns and the greatest risks. It poses significant administrative difficulties for both policymakers who are faced with a complex set of policy decisions and for consumers who are required to become much more active in their usage decisions.

In other industries such as airlines, trucking, and railroads, reforms to rely on competition instead of economic regulation to manage industry performance have been important policy successes. Deregulation has led to lower prices, more efficient operations, and

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expanded consumer choice.<sup>2</sup> These success stories have been a main factor motivating experiments with competition in the electricity sector, and there are strong reasons to believe that these benefits can be extended to the electricity sector. Competition can force firms to make wiser investment decisions and operate their plants more efficiently. Some studies of the early results of competition show that it can lower prices and costs (Kwoka, 1996; Bay Area Economic Forum, 2001b). On the other hand, the large body of evidence indicating that privately owned generation has not consistently operated more cost-effectively than publicly owned generation suggests that the magnitude of the short-run benefits from improved plant operations is not overwhelming. Benefits from competitive generation are more likely to accrue over the long run as competitive firms develop lower-cost portfolios of base load and peaker plants and retire older less-efficient plants. As long as the industry is sufficiently competitive, these lower costs will result in lower prices benefiting consumers.

Competition can also spur electricity service providers to develop innovative service packages to benefit consumers. Under the regulated regime, utilities offered a limited range of price schemes and service options, but there is little reason to believe that this one-size-fits-all policy is best for all consumers. The cellular telephone industry, for example, offers a whole range of price and service options that enable consumers to pick a package that best fits their usage patterns. Because regulated prices do not fluctuate with underlying costs, they provide consumers with predictable and stable bills, but they also fail to reward consumers for conserving during times of high electricity prices. Some customers would prefer a service package that offered less stability but helped them to reduce their average bills and manage their consumption

<sup>2</sup>Of course, there are critics of deregulation who claim that it has not always lowered prices and that lower prices have come at the expense of poorer service quality. Nevertheless, if consumers receive similar price and quality options under competitive and regulatory regimes, there still are reasons to favor deregulation. It reduces the need for government bureaucracy and it empowers consumer choice in that they can discipline poor performance by taking their business elsewhere, which is easier than complaining to a regulator.

more intelligently. Others who preferred stability could retain service options that more closely matched the regulated rates.

Beyond price options, competitive providers could provide new energy services. For larger users, they could market energy management services, and for residential users, they could offer options such as green power—electricity generated by environmentally friendly sources and a popular offering before the crisis. As such services were deployed, they would also have the beneficial effect of spurring demand for and innovation of new energy-management technologies and energy-efficient appliances.

Securing these potential benefits from competitive electricity markets, however, is not inevitable. It requires that both regulators and consumers successfully address the complexities and challenges posed by competitive electricity markets. Other industries that were successfully deregulated, such as airlines and trucking, were structurally competitive. To move toward competition, regulators had to do little more than abandon entry and price controls.

Electricity poses more entrenched issues. Transmission and distribution, two critical components of the electrical system, remain monopolized, requiring regulatory action to ensure access for competitive generators and electricity service providers. Reliable operation of the grid entails balancing the input, output, and flow of electricity at all times, requiring close coordination between all actors. Consequently, the development of a competitive electricity market involves significantly more complex market design problems than previous deregulatory efforts. California has already learned the hard lesson that improper design and implementation can be disastrous. The California debacle, however, remains unique among restructured electricity markets, and there exist numerous more successful reform efforts on which California can and should model its markets.

Successful competition also requires that consumers of electricity become more aware and active. To this point, they have little such experience because under the regulated regime they enjoyed stable and simple bills. To take advantage of the opportunities provided by deregulation, they would have to understand their consumption habits better and be able to assess the implications of differing service options.

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One should not underestimate consumers' ability to make such decisions. After all, they make similarly demanding decisions concerning airline tickets, mortgages, and retirement accounts. At the same time, one should not overestimate consumers either. Given that educated and informed policymakers badly misjudged California electricity markets, it can be expected that numerous consumers would similarly make poor choices if they were confronted with these new consumption decisions.

To move forward with restructuring, California must, at a minimum, redesign its market in a manner that avoids the worst errors that led to the crisis: allowing reserve margins to fall dangerously low, creating an environment conducive to the exercise of market power, market rules that were easily manipulated, a regulatory structure that impeded decisive policy action, and an overreliance on the spot market. Until credible policies are put into place that effectively address these problems, state politicians and voters are unlikely to support a rapid return to competitive electricity markets. In a PPIC Statewide Survey conducted in February 2002, well after the peak of the crisis had passed, only 23 percent of voters supported further deregulation. Thus, if California is to continue down the path of restructuring, it must implement major reforms to ensure that its markets are competitive and will benefit consumers. These include the development of an infrastructure policy to ensure adequate supply, new policies to control market power, a redesign of the market, and the reestablishment of retail competition.

**Infrastructure Policy**

California must develop a healthy investment environment in which private investors build sufficient new generating capacity to meet the state's growing demand for power. Adequate supplies are essential for maintaining system reliability and avoiding the huge price spikes that hobbled California. To accomplish this goal, policymakers must design a market that provides firms clear signals when additional supplies are required and enables them to bring new supplies onto the market in a timely manner.

In the implementation of California's electricity deregulation, increases in spot market prices were the only signal provided to

generators that new investments were required. In this way, California relied on the most highly decentralized, market-oriented system possible to manage long-run electricity supply. In contrast, market designs implemented in other areas incorporate differing levels of regulatory oversight. Four models can be identified. Ranging from the most market oriented to the most centrally planned, they include: (1) reliance on spot markets as in California, (2) markets for capacity, (3) direct payments for capacity, and (4) state planning for capacity. The main tradeoff presented by these options is between the greater efficiency of the more market-oriented proposals and the more stable prices offered by the options that include a great degree of centralized planning.

Although the current system of relying on spot market prices to induce investment failed in California, it has performed well in other deregulated markets. In Chile and Victoria, Canada, for example, reductions in reserve margins did lead to increases in wholesale prices, although not the sudden and sharp price spikes experienced in California. Higher prices induced timely expansions in capacity, which then led wholesale rates to decrease smoothly (Bay Area Economic Forum, 2001b). Relying fully on spot markets offers the prospect of greater long-run efficiency because over time market participants could learn what is the best level of reserve capacity and adjust their actions accordingly. Spot markets, however, are volatile. In California, spot market prices remained low as reserves tightened and then spiked suddenly when system capacity was being strained. Such volatility complicates long-run planning for investors. More important, for such a market to perform successfully, consumers will need to be willing to curtail energy use in response to tightening market conditions.

A second model, implemented in New York, New England, and the PJM Interconnect operating in Pennsylvania, New Jersey, Delaware, and Maryland, develops a market for electricity capacity. A regulator or other market-coordinating body mandates that all electricity service providers maintain control over sufficient capacity to serve their client base and provide a preset level of reserves. This capacity can be provided by owning physical generation plant, contracting with other generators, or purchasing capacity rights on a spot market. In this capacity market, when the price of purchasing capacity rights exceeds the cost of

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constructing additional capacity, generators have incentives to build their own capacity or contract for new capacity. Some experts argue that a capacity market provides investors better price signals that will increase more gradually as reserves tighten and that are easier to understand (Bay Area Economic Forum, 2001b; Cambridge Energy Research Associates, 2001a). The advantage of enabling the regulator to set reserve levels explicitly is that it can promote price stability by keeping margins sufficiently high. The disadvantage is that the regulator may choose an inefficiently high level of reserves, forcing firms to have a higher cost structure than necessary.

A third model calls for the regulator to provide incentive payments to generators when they make capacity available. In Argentina, for example, all generators that sell power during periods of peak demand receive a fixed payment for the capacity they made available, and generators that offered capacity that is not used receive a variable payment. As with the capacity market model, this system provides direct and clear incentives for providing capacity to the market. Its main disadvantage is that the regulator must set the payment level, a task that is more difficult than establishing a capacity reserve requirement. Payments that are too high allow generators to earn above-market returns, and payments that are too low may fail to provide sufficient incentives to expand capacity when needed. This system has functioned well in Argentina; the United Kingdom recently abandoned it in favor of a system similar to California's spot market approach.

In the fourth model, California can manage infrastructure planning and investments more directly. Before restructuring, California practiced integrated resource planning, an effort to combine the forecasting of energy demand and capacity needs with the development of plans to meet energy needs in the most cost-effective manner possible. Under restructuring, the role of integrated resource planning diminished, but the state could once again undertake a more central role in long-run planning that either augments or works in conjunction with private sector investment decisions. Active state-level planning can contribute to the stability of the system by alerting policymakers to impending shortages, but such planning is no panacea. State forecasters, after all, failed to foresee the shortage that hit the state in the summer of 2000.

The newly created California Power Authority, in consultation with the CEC, recently developed such a broad investment plan, although there is no requirement to update the plan in future years. The California Power Authority has also been granted broad authority to expand on these planning duties by directly owning or investing in power plants. A public role in investment planning could counter the biases of market-driven investment. Incumbent generators enjoy higher prices and profits when supplies are tight, potentially creating a bias against investment. In addition, private investors are beholden to the unpredictability of capital markets and, since the Enron bankruptcy, investment funds have dried up, forcing the cancellation or delay of several projects. The main danger of public investment is the potential for crowding out. If the CPA consistently builds as reserves drop, wholesale prices may remain depressed, deterring private power producers from investing in California. A preferable alternative would be for the CPA to assist the private sector with project funding, thereby avoiding the dangers of crowding out while helping ensure the construction of necessary capacity expansion.

Under all these models for signaling the need for capacity expansion, policymakers must also ensure that power projects can move smoothly and with a minimum of delay from identifying needs for additional capacity, to procuring regulatory approvals and financing, to construction and startup. The California crisis clearly showed the consequential effect that short-run shortfalls in generating capacity can cause. Policies that facilitate the development of new supplies in a timely manner, therefore, are needed. Policymakers have several options that may ease the financing, regulatory review, and construction processes.

Expanding the role of long-term contracts for wholesale power is an important first step. Permitting investors to sell their power in forward markets or through bilateral contracts will enable them to get firm price commitments before plant construction, thereby easing the financing of capacity additions. The permitting process is in need of streamlining. Since 1998, there has been a strong supply of applications for new plant construction in California, indicating that the regulatory approval process has not deterred investment. Nevertheless, the length of the process remains a concern. Fewer delays would shorten generators'

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planning horizon, making it less likely that unexpected spurts in demand would outstrip supply while a facility is under construction.

The state and in particular the California Energy Commission undertook several actions during the crisis to expedite the review of new proposals. Many peaker plants were constructed under these guidelines and expedited review options remain in force. Given that California's electricity demand will continue to grow, requiring additional plants, these improved procedures must be maintained and strengthened. If expedited review diminishes environmental checks, there is a risk that environmental goals may be compromised. Further study on how these actions affect the tradeoff between expanding capacity versus preserving environmental and community quality will be needed.

**Controlling Market Power**

Vigorous competition is needed if consumers are to benefit from restructured electricity markets. Ensuring that electricity markets are workably competitive requires a multipronged strategy including measures on how the market is regulated and how it operates. On the regulatory side, California needs to reassess its relationship with FERC, establish price caps, develop policies that prevent the strategic withholding of generating capacity from the market, and reconsider the structure of the electricity sector. On the market side, it needs to ensure that there are adequate reserves and improve the demand-side responsiveness in the market.

One consequence of AB 1890 is that it split regulatory authority between FERC, which now regulates wholesale markets, and the CPUC, which retains control over retail markets. During the height of the crisis, this divided authority fomented strident differences between state and federal regulators, impeding policy action. To avoid repeating that policy failure, California policymakers need to understand FERC intentions and cope with the interdependencies between state and federal decisions.

FERC is statutorily mandated to ensure "just and reasonable" wholesale rates. Early in the crisis it determined that wholesale rates were not "just and reasonable," but it declined to intervene aggressively, leaving California to address the crisis alone. FERC did change directions later, imposing binding, regional price caps in June 2001.

That action paired with its more recent response to revelations of market gaming by Enron appear to signal a renewed seriousness concerning market policing, but other actions have sent mixed signals. FERC replaced its existing price cap, formerly set at \$91.87, with a much higher \$250 cap, and FERC has been slow to act on the multiple complaints of market mitigation that California has brought.

If California can have confidence that FERC will be a more vigilant market watchdog in the future, the state has greater flexibility in the way it transitions back to competitive markets. For example, it can pursue policies that promote goals such as consumer protection with the confidence that even if these policies impinge on market competitiveness, FERC can act as a backup in case the forces of competition slacken excessively. If, on the other hand, FERC retains its laissez-faire ways, California faces more constrained policy choices. It must develop a regulatory and market framework that ensures that market forces operate strongly at all times, even at the cost of neglecting other goals such as bill stability, administrative feasibility, and environmental concerns. Such a competitive market would involve, among other features, fully exposing consumers to the volatility of wholesale market prices and ensuring that new capacity can be brought onto the market quickly. To do otherwise risks repeating the unchecked exercise of market power. (See Wolak, 2001, for an excellent discussion of market design in the absence of FERC control of market power.)

FERC also continues its attempts to expand its authority over electricity markets by striving to organize a small number of regional energy markets with common market rules within the United States. This effort is highly controversial and is being contested in the courts and in the U.S. Congress. If FERC prevails, however, California may have no choice but to work toward reestablishing competitive wholesale markets and remold its regulatory goals and methods accordingly.

Although no panacea, price caps are an important tool for controlling market power. The debate over price caps was one of the most highly politicized dimensions of the California crisis. Advocates, including many California officials, argued that price caps were necessary to protect ratepayers from gouging by generation firms. They saw caps as the most direct and powerful policy tool for accomplishing this goal.

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Free marketers, including key FERC commissioners, retorted that price caps do nothing to ameliorate the fundamental market imbalances causing high prices and lead to inevitable market distortions worse than the original problem.

The main criticism against price caps leveled by economists is that they lead to market shortages by discouraging investment in additional capacity. Almost everyone who has taken a course in introductory economics has been exposed to the argument that rent control (i.e., price caps on rental housing prices) encourages landlords to remove units from the market, leading to a shortage. A critical point largely missing from the debate (and most textbooks) is that *when firms exercise market power*, price caps do not have this undesirable side-effect. In fact, they can encourage firms to expand the amount they supply to the market (see the appendix for details). Given the mounting evidence that electricity generators are able to exercise some amount of market power, there are strong economic arguments in favor of judicious use of price caps in electricity markets. In fact, price caps are a common feature in deregulated electricity markets, although they are typically employed as a backstop measure leaving prices to be determined by the market under most circumstances.

Despite these theoretical arguments in their favor, price caps in the California market have had a checkered record, indicating that they must be designed carefully. At its inception, the California ISO implemented a \$750 per MWh cap for electricity it purchased in the California real-time market. As the crisis heated up during the summer of 2000, the ISO lowered the cap twice to \$250 in an effort to control prices. These caps did decrease the peak prices paid for power, but they also had negative side-effects. They tended to increase all bids submitted to the ISO, thus, the average costs did not decrease as much as expected. Second, when the prices of natural gas and NOx pollution permits increased, the cap was probably lower than the costs of generating power at many plants, deterring production. Finally, the ISO could cap the price of electricity bought only in California, creating incentives to export power to neighboring states (Bay Area Economic Forum, 2001a, p. 14).

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At the peak of the crisis, the ISO completely abandoned its price cap in a desperate move to keep the lights on. FERC replaced those "hard" price caps with a "soft" cap of \$150 in December, but wholesale prices soared above \$300 per MWh.<sup>3</sup> FERC subsequently amended these with hard, regionwide caps in June 2001 at which time wholesale prices moderated substantially.

A number of lessons can be taken from this experience. First, regulators must be careful to not set the caps below the marginal cost of generation. Fortunately, the marginal production costs of electricity are well known because of years of cost and environmental regulations of power plants. Therefore, it is feasible to determine an appropriate level. This cap should be indexed to the costs of inputs such as natural gas and NOx permits to allow for changing market circumstances. Second, caps must be credible. If adjacent markets lack caps, generation will flee the state in search of higher prices. Also, when supply reaches emergency levels threatening blackouts, energy buyers may purchase energy "out-of-market" and pay prices above the official cap. This behavior creates incentives for players to engage in a disruptive game of chicken in which generators withhold supplies until the purchaser, desperate to avoid blackouts, is willing to pay above-cap prices. Effective price caps, thus, must apply to the entire region in which electricity is traded, not just one state in that region, and regulators must demonstrate discipline in upholding stated caps.

Third, price caps should be employed only as a temporary stopgap measure. If price caps are left in place over the long run, they may create disincentives to enter either the generation market or the retail market, thereby impeding transition to a workably competitive market in the long run. Also, experience from gas and oil markets indicates that enforcement becomes increasingly bureaucratic to deal with over time as producers demand exceptions and make efforts to evade caps (Hogan, 2001a). Finally, given that most of the financial damage inflicted by the crisis occurred as California and FERC debated over the appropriateness

<sup>3</sup>A "hard" cap means that no bid above that amount will be accepted. A "soft" cap accepts all bids below the capped amount. Bids above that amount are still accepted but must be cost-justified later.

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of price caps, state and federal regulators must come to a clearer understanding of how and when price caps will be implemented *before* returning to a competitive environment.

Considering that at the height of the crisis thousands of megawatts of generating capacity remained out of operation, California policymakers must establish methods for ensuring that capacity is made available when it is needed. One approach that has been considered relies on direct inspection of facilities. It would mandate that the CPUC set maintenance schedules. If a plant does not operate when it is scheduled to be on-line, the CPUC would then inspect the plant to ensure that the plant is off-line for mechanical and not strategic reasons. This approach is limited, however, by the grave difficulties an outside party faces in evaluating plant operations. Generating plants are large, complex, and idiosyncratic operations. An inspector is in no position to second-guess the judgment of plant managers who have years of experience with, and knowledge about, specific operating needs. Alternatively, regulators could require that all plants supply power to the market except for days on which maintenance is scheduled and a limited number of days for unexpected problems. Beyond this allotment, for all days that a plant does not supply power, it would be responsible for acquiring an equivalent amount of electricity on the open market. In this way, regulators would shift the financial risk of mechanical breakdowns onto generators and avoid the unworkable task of inspecting plants.

Effective competition may also be hindered by the structure of California's generation market. The largest merchant generator, AES, controls only 4,700 MW of capacity, less than 10 percent of the market at peak summer demand. Applying standard measures of market concentration, a market composed of ten firms the size of AES would be deemed unconcentrated, implying that any single firm had little ability to influence market prices. There is increasing concern, though, that because of the real-time needs of electricity grids, similarly sized firms have much greater influence. On high demand days, even small generators may control the net margin of power—the difference between total load and power available from others. In those cases, that generator

is in an unusually strong bargaining position because its power is absolutely necessary if blackouts are to be avoided.

In response to these concerns, the United Kingdom has forced the two largest privatized generating firms, PowerGen and National Power, to sell off over half their capacity (Bay Area Economic Forum, 2001b). FERC has also recently enacted new market structure rules that place much stricter constraints on the size of wholesale power producers (McNamara, 2001a). California policymakers must pay close attention to the size and market power of generators active in its market. Such vigilance would be especially warranted if PG&E succeeds in its efforts in bankruptcy court to transfer its significant generating assets to an unregulated entity. Having a larger number of firms, each controlling a smaller portion of the market, is likely to be desirable, although there is the danger of excessive divestiture preventing generators from taking advantage of economies of scale and scope, increasing overall industry costs.

Regulatory rules controlling the behavior of generators cannot alone prevent the exercise of market power. The market itself must operate effectively and discipline producers who bid high prices for the sale of their power. High bids are unprofitable when it causes generators to be left out of the market as the ISO matches demand with the lowest supply bids. These risks are greatest under two circumstances. The first is when supplies are ample, forcing multiple generators to compete aggressively to have their power dispatched. In California, the evidence shows that at low loads the markups for power are small but that they increase steadily as demand approaches system capacity (Bushnell and Saravia, 2002). Consequently, all the policies discussed in the previous section that maintain adequate reserve margins also help control market power by forcing generators to bid more aggressively. Controlling market power through high reserve levels is not cost free, however, in that rarely used capacity is expensive to build and maintain.

The second factor that can force more competitive bidding is increased demand responsiveness. If consumers curtail usage in response to price increases, generators who bid high are less certain that their power will be dispatched, forcing them to bid more aggressively. Moreover, demand responsiveness substantially decreases the benefits of

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withholding generation capacity unilaterally. If demand decreases, even slightly, with higher prices, the price increase generators can effect through withholding power decreases and the amount of power they can expect to sell at the higher price also decreases. The exact degree of demand responsiveness required to thwart unilateral withholding of capacity, however, remains uncertain, and even reasonably responsive demand may not suffice by itself to curtail the exercise of market power (Borenstein, 2001).

More detailed discussion of policy options for facilitating demand responsiveness are described below. The benefits of improved demand responsiveness extend beyond their effects on generator competitiveness. Thus, such policies should be pursued regardless of whether California continues with competitive markets or decides to emphasize public power or regulation. At this point, it is only necessary to point out that to the degree that California cannot rely on FERC to police market power abuses, market policies that maintain high levels of reserve and aggressively promote demand responsiveness will be necessary to protect consumers from market power.

**Market Design**

The many shortcomings in the design of California's electricity market must be addressed, although the exact amendments that should be made are a matter of debate. California can learn from other, more successful, electricity markets. Nevertheless, the design of competitive electricity markets remains an excruciatingly complex enterprise. All efforts at market restructuring have met with unexpected problems that have required midcourse corrections, raising doubts that a competitive, complete, and robust model already exists. A detailed discussion of market design is beyond the scope of this report. The recent market redesign proposal developed by the California ISO and submitted to FERC is over 200 pages long. Three central points, however, warrant mention.

The first is that the California market must allow long-term power contracts to have a much greater role. The ephemeral attractions of the spot market early in the restructuring process (e.g., increased regulatory transparency and low prices) camouflaged the risks and volatility that

overreliance on spot markets entails. Greater use of long-term contracts will help control risks and improve the stability of the market. In addition, they can help mitigate the exercise of market power by expanding the markets in which generators must compete to sell their power. Competition for airline tickets, for example, does not occur only at the gate minutes before departure. Rather, competition is fiercest in the markets to purchase advanced tickets, when passengers are better able to compare prices and rearrange their travel plans. Passengers arriving at the last minute are typically forced to pay a premium price. The same logic applies to electricity markets, in that buyers can have a wider range of choices and more competitive prices when they purchase electricity in advance. The DWR has effectively accomplished this goal for the time being by locking in large quantities of power for as long as the next ten years. Nevertheless, regulators must still develop rules under which the utilities and other electricity service providers will enter into bilateral contracts, forward contracts, and long-term contracts.

It is important to note that although forward contracts increase competitiveness, reduce short-run price volatility, and mitigate market power, they do not, in themselves, guarantee lower prices for consumers. In the spring of 2000, for example, forward prices in California were less than \$80 per MW and spot market prices hovered around \$250. In contrast, at the same time New York forward prices were \$140 and spot market prices turned out to be only about \$80. Over the long run, forward prices in a competitive market will be similar to the average of spot market prices (Borenstein, 2001). In other words, although long-term contracts can protect consumers from price spikes, they will not protect them against higher prices resulting from persistently tight electricity supplies.

The second issue involves the degree of centralization of decisionmaking authority. California chose a design that relied much more on market transactions and less on centralized management by the ISO than other restructured markets did. This choice created a system that is especially unwieldy to manage during system alerts, as system operators scramble to maintain the grid. Policymakers should be concerned about such inefficiencies. There is strong evidence that vertically integrated utilities obtained significant operational savings from

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their central management of generator dispatch and transmission (Kwoka, 1996). Overreliance on markets for the dispatch of all specialized services required to maintain reliable grid operations risks squandering the benefits of centralized grid management.

The third issue concerning market design is that the way market rules are developed will be as important as the specific rules. The implementation of AB 1890 has been severely criticized. As one market observer described it:

Ideological rhetoric played a bigger role than serious analysis or practical experience drawn from other countries. In the end, the ultimate design of the wholesale market institutions represented a series of compromises made by design committees including interest group representatives, drawing on bits and pieces of alternative models for market design, congestion management, transmission pricing, new generator interconnection rules, and locational market power mitigation. . . . Getting it done fast and in a way that pandered to the many interests involved became more important than getting it right (Joskow, 2001, p. 14).

The current environment still poses hurdles to a constructive debate. Many state policymakers mistrust the energy traders whom they blame for the energy crisis. Generators and energy traders are wary of the ISO as it has become politicized during the crisis, and California and FERC, who approves electricity market designs, remain on chilly terms. The ISO, who is responsible for market design amendments, operates in isolation from California policymaking bodies. Creating a forum in which these players and independent experts can come together is necessary to move the process forward.

#### Retail Competition

Retail competition was a major feature of California's original deregulatory framework, but its future remains in doubt, since the CPUC suspended direct access in September 2001. The impetus for suspending direct access was the need to repay the \$42 billion worth of long-term contracts into which the state had entered. The price of the electricity purchased through these contracts has been significantly higher than spot market prices since the worst of the crisis passed. If consumers were allowed to turn to alternative suppliers, they could avoid paying for

the more expensive state power, thereby increasing the costs borne by the remaining consumers.

Having all California consumers pay their fair share of the costs of the crisis is a worthy goal, but its pursuit need not derail efforts to promote retail competition. The state can retain policy flexibility by pooling the costs of the contracts that will exceed the future costs of power bought on the competitive market. The extent of these additional costs remains in flux because of pending cases before FERC and uncertainties over future wholesale rates and interest rates, but rough estimates range between \$12 billion and \$25 billion. California could then arrange to pay down this pool of excess costs through a nonavoidable charge to be levied on electricity users for the term of the contracts. A charge in the range of 0.7 cent to 1.5 cents per kWh would suffice. This charge would be similar in concept to the competitive transition charge that paid for the sunk costs faced by the utilities after restructuring. With such a charge in place, all consumers would help pay down these costs no matter which electricity provider they choose.

Reinstating retail competition would help promote a number of goals for the electricity sector. It would simplify regulatory tasks by reducing the need for oversight of the electricity sector. Even with a fully competitive wholesale market, insufficient competition at the retail level would leave electricity retailers free to charge monopoly prices to captive customers and would fail to provide incentives for retailers to control their electricity procurement costs. Consequently, it is only when consumers are able to compare and choose between a variety of providers that the market forces can replace regulation as the method of disciplining electricity service providers.<sup>4</sup>

Retail competition can also play an important role in controlling market power. The opportunity to choose between providers can stimulate individuals and firms to become more active and intelligent consumers, and if this stimulates demand-side responsiveness, it will constrain the ability of generators to demand high prices for their power.

<sup>4</sup>Even with competitive electricity service providers, regulation will still be necessary to ensure the financial stability of ESPs. This oversight, however, is more like the regulation of financial institutions, such as Savings and Loans, than traditional utility price regulation. See Wolak (2001) for details.

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Finally, competition between service providers can also stimulate the creation of innovative price and service options, leading to increased efficiency in electricity production and consumption. We could see an effect similar to that in the cellular phone industry, which offers a much wider range of pricing and service plans than the regulated wireline telephony does. Such potential innovations include real-time pricing options, long-term contracts for end users, and energy-management services.

The extent of these benefits and the time frame in which they are realized, however, depend on the strength of retail competition, the innovativeness of retailers, and the active involvement of consumers. Despite its attractiveness, retail competition has developed slowly and has suffered setbacks in other markets. Firms specializing in retail electricity service have not been performing well, and even in states considered a success story in terms of retail competition, such as Pennsylvania, the vast majority of customers remain with incumbent utilities (McNamara, 2001b). There are instances in which ESPs have offered innovative price and service packages, but these have, for the most part, targeted large customers. Efforts to lure small customers, in contrast, have focused on simple rate discounts or green energy. This early record is not surprising given that competition often takes time to develop in formerly regulated industries. It does raise questions about the degree to which residential and small business consumers are willing and able to analyze their electricity purchases actively, but as experienced in other deregulated markets, such as telephone equipment and long-distance calls, consumers have become accustomed over time to making new choices among multiple providers.

Regulators face a number of choices concerning the implementation of retail competition. The right mix of policies can promote the speed with which competition develops and improve the efficiency in the retail market, although these choices generally come at the expense of increasing the volatility of consumer bills and the complexity of consumer choices. The first choice is the default provider—the firm assigned to provide electricity to consumers who do not actively select a provider. Assigning this role to the incumbent utilities simplifies life for passive consumers who continue to be served by the same firm but

increases the barriers to entry for new ESPs. Alternatively, the default service can be auctioned off to the provider or providers that offer the lowest price offering. Such an auction helps establish the correct price for default service and facilitates entry. Another policy that can promote the development of retail competition is to assign customers randomly to qualified ESPs. This system allows new entrants to get established quickly, although it forces some customers to switch providers against their will.

The second choice relates to the level and structure of the default offering. The price can be either fixed or vary with underlying wholesale rates. Fixed rates offer consumers added stability, although they must be tied to the long-run underlying costs of power (e.g., either long-term contracts for power or costs of owned generation) if California is to avoid repeating the financial crisis from which it is only now emerging. Variable default rates have the benefits of improving efficiency and forcing consumers to be more active, but they place greater risk and complexity on consumers. Variable rates are discussed in greater detail in the next chapter in a discussion of demand responsiveness programs.

The level of default rates is another important variable. Setting the rate low protects consumers, but it makes it difficult for new service providers to enter the market profitably. A higher default price gives customers greater incentives to experiment with new electricity service providers and facilitates new competitive entry. Higher default prices, however, disadvantage passive consumers.

#### **Transition Strategy**

Developing a well-functioning electricity market in California also requires a transition strategy. The success of other restructuring efforts demonstrates that markets can be made to work. Nevertheless, they are complex, and successful markets have numerous components, all of which must be operating for the system as a whole to function. These components include, among other things, a sufficient number of competitive wholesale generators to yield competitive results, active spot and forward markets enabling market participants to hedge risks, a competitive retail market that offers a wide range of price and service options to accommodate consumers' differing risk preferences and

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consumption habits, and consumers who are able and willing to manage their electricity consumption intelligently. Given that institutions and behaviors develop only slowly over time, not all of these components can be in place immediately. The transition stage—when some components, such as wholesale markets, are in place whereas others, such as retail competition and hedging of market risks, remain underdeveloped—poses significant risks of which policymakers must be wary.

A successful transition requires sensitivity to the interdependencies among these components and attention to getting them all in place. Actions must be carefully ordered. For example, active retail competition must be established before lifting retail price controls if consumers are to be protected during the transition. Similarly, a more controlled transition toward retail competition may be warranted. Large users, who have greater capacity to manage their consumption, could be offered competitive choices first, with residential and small business users being given more time to adjust. Finally, a transition strategy must include mechanisms for addressing unexpected problems as they arise and facilitating midcourse corrections.

#### Hybrids

Policymakers have expressed interest in hybrid industry structures that entail various combinations of government ownership, rate-of-return regulation, and competition. These include continued wholesale competition in conjunction with regulated retail markets, competitive markets with active participation of government-owned entities, and schemes that differentiate among consumer groups, allowing some, such as large industrial and commercial users, to shop for competitive power while continuing to provide regulated power for other groups, such as residential and small business users. The attraction of these hybrids is that they appear to enable policymakers to pursue what are otherwise conflicting goals and they provide a smoother transition path toward a final industry structure.

Such hybrids, nevertheless, must be designed carefully. The roots of the California crisis can, in part, be traced to the pursuit of multiple goals, each of which was valuable and reasonable in isolation. Developing wholesale competition for power made sense as a means to

enhance efficiency. The retail price freeze enabled the utilities to recoup their stranded costs. The 10 percent rate reduction provided to residential and small business customers could be supported as a means to ensure that the benefits of competition were shared by all customer classes, and the constraints the CPUC placed on long-term contracting were needed as a means to protect captured consumers from inflated contract prices and to promote regulatory transparency.

In combination, however, the pursuit of these goals created an explosive mix. The rate reduction and freeze stifled retail competition, because small customers had little incentive to explore alternative service options. The lack of retail competition, in turn, bolstered the CPUC's resolve to review the prudence of long-term contracts. Both of these then increased the utilities' exposure to the spot market, which led to financial disaster when spot market prices shot up.

The interactions of policies that pursue different goals are therefore paramount, and policy designs must combine elements that are compatible. One principle that should be followed is that utilities and other energy service providers must balance the term structure of their retail and wholesale transactions. If an ESP buys power on the spot market it must sell power at prices that fluctuate with the wholesale spot market. In contrast, if an ESP provides its customers with fixed prices for a specified length of time, those sales should be backed up by fixed-price, long-term contracts of similar duration. With such a balance, the retail price freeze implemented in AB 1890 was an achievable policy goal if the utilities had entered into long-term contracts. Conversely, forcing the utilities to buy on the spot market was also a legitimate goal, but only as long as consumers paid rates based on spot market prices. It was the combination of a price freeze with spot market purchases that led to disaster.

Another principle is that the roles of competition and of price and quality regulations must be carefully balanced. They rarely coexist in the same market successfully over the long run. Continued regulation can thwart the emergence of competition by impeding new entry and customer choice. At the same time, sufficient competition must exist for consumers to benefit from deregulation. This can lead to a vicious circle in which neither effective competition nor coherent regulation prevails.

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If insufficient competition exists to justify immediate deregulation, regulators must decide whether to maintain existing regulations or to develop a clear path that promotes entry and active consumer choice so that competition can prevail. In addition, mixed regulatory schemes in other industries, such as telecommunications, have typically led to artificial distinctions between service and customer categories. These distinctions create a host of opportunities for market participants to game the system, complicating regulatory tasks and leading to unintended consequences.

The strict tradeoffs between policies that promote stability and those that promote efficiency are also underappreciated. Improvements in system efficiency depend on firms and individuals being able and willing to respond to incentives by changing, among other things, the way they run plants and how they consume electricity. At the same time, firms and individuals seek to buffer themselves from environmental vicissitudes and risks because it is expensive and difficult to be constantly changing one's routines. Such buffers, however, reduce the incentives to engage in efficiency-enhancing actions. Consequently, improved stability comes at the price of reduced efficiency, yet there is continued confusion about this tradeoff. It is not widely understood that long-term contracts are likely to include a premium for the price stability they provide the purchaser. More generally, the tradeoff is often treated unevenly. The same analysts who advocate exposing consumers to greater price volatility also advocate that utilities should sign more long-term contracts to mitigate the volatility of spot market energy purchases. If utilities benefit from long-run price stability, it is certainly at least as valuable for consumers.

### Conclusions

Table 4.2 presents a summary of how the main institutional alternatives satisfy the main goals for the electricity sector. Overall, policymakers face a choice between the greater stability, reliability, and administrative feasibility of regulated utilities or public ownership versus the prospects for greater efficiency gains through competitive markets. In terms of environmental protections, no market regime clearly

Table 4.2  
Alternative-Criterion Matrix: Institutional Alternatives for California's Electricity Sector

	Public Ownership	Regulate	Market	Hybrid
Low prices	Good historical record Able to target favored groups Historical advantages Historical stability, but available in future	Good historical record Able to target favored groups Failure in 1980s led to deregulatory push	Promoting competition requires higher default rates Competition can drive prices down Results from recent deregulation experiments uncertain	Can target low prices to certain consumer groups
Bill utility	Weaker record in California than in regulated monopolies	Strong record	More volatile prices Can be mitigated with long-term and hedge contracts	Can protect certain consumer groups from volatile wholesale rates
Efficient resource use	Similar to regulated private monopolies	Weak incentives Risk of over capacity Can be improved with marginal cost pricing and incentive regulation	Potential for significant improvements Inefficient resource allocation Deregulation requires careful design of markets	Hybrid retains efficiency gains from competition Can create perverse incentives
System reliability	Good in long run Risks of transition	Strong historical record Long tradition of attracting investment Investment in post-crisis environment less certain	Market-based investment susceptible to boom-bust cycles Poor coordination at times of system crisis Requires greater demand-side management	Mix of design features must be chosen carefully

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Table 4.2 (continued)

	Public Ownership	Regulate	Market	Hybrid
Administrative feasibility	No state or local structures exist to support major power effort Will face concerned political resistance	Rules are transparent and well understood Buy-backs of generating capacity may not be feasible Regulating procurement with long-term contracts is feasible Likely resistance from utilities	Complex market design and regulatory issues Regulatory control shared with FERC Requires active consumer decisionmaking	Systems of mixed rules are complex and contentious
Environmental provisions	Public managers retain discretion to pursue environmental goals	Success with demand-side management Bias toward overcapacity leads to environmental damage	Could be degraded if environmental review is not required Created market for green power Competitive firms may respond better to environmental incentives Improved efficiency decreases environmental damage	
Other	Less desirable: if generation market as it becomes structurally competitive More appropriate for transmission and distribution monopolies	Less desirable: if generation market as it becomes structurally competitive Still necessary for transmission and distribution monopolies		

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dominates the others, mainly because environmental results depend on complex interactions between each regime and existing environmental regulations.

The nature of the tradeoffs differs, however, for different segments of the electricity industry: generation, transmission, distribution, and retail marketing. The arguments in favor of competitive markets are strongest for generation. This segment of the industry has been most affected by technological changes that have led to ever-smaller plants that generate power at competitive costs. State-of-the-art dual cycle gas-generating plants have a capacity of about 500 MW, a fraction of the size of California's market, and cogeneration facilities are even smaller. These plants have enabled new players to enter the market as power producers and large power users to self-generate economically. Consequently, the California electricity generation market is wide open with hundreds of private and public entities owning plants. In such a world, regulation or public ownership becomes increasingly anachronistic. As long as a competitive environment can be maintained, reliance on multiple providers each competing against the others is more likely to provide reasonable service than depending on the good performance of a single monopolist.

In the short run, policymakers may choose to restrain the development of competitive generation markets if they wish to promote a more stable electricity sector and are wary about ceding control to FERC for mitigating the market power of competitive generators. Nevertheless, they should be aware that the march of technology will continue, making it increasingly difficult and inefficient to bottle up alternative providers. Planning for an eventual transition to a more competitive market is important, and policymakers need to avoid choices that will impede such a move in the future. Specifically, they should avoid forcing the regulated monopolies to buy or build additional capacity in the short run. Such policies simply increase their market power, impeding the development of a competitive market in the future. Similarly, it would be a mistake to assign the full costs of the state's long-term contracts to the utilities with the expectation that regulated rates will allow them to recover these costs fully. Such a move would create a significant cost

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difference between utility and merchant generators, leading to political impediments to opening up their markets to competition.

Transmission and distribution functions remain monopolies, making some form of regulation necessary to ensure reasonable rates and open access to all generators and final users. Public ownership is a feasible alternative, and the state's aborted attempt to purchase the utilities' transmission lines in exchange for financial bailouts would have made sense at the right price. Other attempts at public buyouts of transmission and distribution assets, however, will be equally controversial and expensive. Continued regulation of privately owned assets offers the most reasonable and well-understood alternative.

In the retail segment, the tradeoffs between regulated versus competitive structures depend on consumers. Potential efficiency gains from competition are derived by changing consumer behavior, making them more aware of the real costs of electricity and compelling them to change their consumption accordingly. These gains can come about, however, only if consumers are fully exposed to price volatility and are willing and able to manage that volatility.

If consumers wish to be shielded from such volatility and wish to remain passive consumers of energy, the benefits of a competitive regime are reduced. Resistance to price hikes and more complex pricing proposals suggest that consumers are not interested in being exposed to price volatility. Opinions, though, probably differ between different customer groups (e.g., residential and small business versus larger business users) and can change over time as customers understand how competition can enable them to reduce their overall energy costs. These differences suggest that a hybrid model with retail competition introduced in stages, first to larger customers and only later to smaller customers, offers important advantages.

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## 5. Overarching Recommendations

While California policymakers grapple with the fundamental issues of reconstituting the market and regulatory institutions of the electricity sector, they should take a number of actions to make it more robust no matter what reform path is taken. The California crisis exposed a number of weaknesses in the management of the sector. Early in the crisis, California lacked mechanisms to elicit consumer conservation in response to tightening electricity supplies and rising wholesale prices. The absence of a demand response exacerbated the crisis before the summer of 2001 when considerable conservation efforts were made, helping to tame wholesale rates. The crisis also revealed the interdependencies among components of the state's energy infrastructure and the dangers of neglecting any single component. Inadequate transmission capacity, for example, exacerbated shortages in generation capacity, and a heavy reliance on gas-fired generation made California particularly susceptible to disruptions in the natural gas market. Finally, the crisis highlighted the need for effective and responsive policymaking to manage this increasingly complex and volatile area.

The successful development of an efficient, low-priced, and reliable electricity system depends on addressing these weaknesses. This chapter discusses actions the state can take to improve demand responsiveness, develop a more comprehensive infrastructure strategy, and reorganize and clarify its policymaking functions.

### Improve Demand Management

The implementation of AB 1890 focused almost entirely on the supply side of the electricity market, working to create a competitive wholesale power market. Reforms of the demand side of the market were, in contrast, ignored and often undermined. Regulators failed to

promote retail competition. Funding for conservation programs was reduced, and consumers were shielded from price fluctuations. As policymakers continue to seek ways to lower the costs of electricity and improve the efficiency and reliability of the system, demand-management policies cannot be left out of the equation.

Successful conservation efforts contributed significantly to the unexpected passing of the crisis at the beginning of the summer of 2001. Reductions in peak demand amounting to as much as 14 percent in July helped avert the widespread blackouts that had been predicted. It is important to note that these extraordinary conservation efforts were achieved without derailing the California economy or causing undue individual hardships. In fact, in a survey of Southern California Edison customers conducted for the California Energy Commission, 70 percent of respondents said that their conservation efforts had either no serious effect on their lifestyle or even possibly improved their lifestyle (California Energy Commission, 2002a).

Policymakers implemented the conservation measures in 2001 as a crisis response, but they should not think of these programs as solely emergency measures. Conservation programs offer significant potential benefits under a wide range of market conditions and regulatory environments. Reductions in peak demand, for example, can decrease the costs of generating electricity by reducing the need for investments in peaking capacity and transmission plant, thereby reducing prices. California has a long and successful record of incentive programs promoting investments in energy efficiency, and these efforts have been found cost-effective in comparison to investments in additional generating capacity. For individual users, the rationale for increasing energy efficiency has never been stronger. Because Californians will face significantly higher rates for several years because of the crisis, the savings from conservation are especially great.<sup>1</sup>

<sup>1</sup>It is true that high electricity prices give individuals and firms greater incentives for conservation, but the same is not true for the state as a whole. Higher electricity rates going forward will primarily pay for costs that have already been incurred, the cost of the long-term contracts signed during the crisis, and debt accrued by the utilities. These sunk costs cannot be avoided even if the state dramatically and permanently reduces its overall demand. Future conservation efforts by the state save only the avoided costs of additional

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Demand-side management can also play an important role in improving system reliability. Because energy consumption can be altered more quickly than new generation can be brought on-line, demand responsiveness is important for keeping supply and demand in balance, especially in times of tight supply. Finally, such programs are also environmentally friendly, by reducing emissions and avoiding the construction of additional plants. These programs should be a standard feature of a well-functioning electricity sector and need to be expanded and made permanent.

Traditionally, demand-management programs have focused on conservation and enhancing energy efficiency. One set of programs has focused on developing and imposing efficiency standards for building construction and appliances. A significant improvement in the efficiency of air conditioners, for example, could forestall the need for additional plants because air conditioning represents as much as two-thirds of usage during summer peak hours. Other programs have been implemented to identify opportunities for efficiency-enhancing investments and to create incentives to make those investments. For example, since restructuring, the CPUC and CEC have administered a public goods program that has collected a fee from ratepayers and allocated grants for efficiency-enhancing investments. The recently formed California Consumer Power and Conservation Financing Authority has also been given the power to invest up to \$1 billion in conservation programs, although these programs remain under development.

Another method is to offer direct incentives for conservation. An example is the 20/20 program that was a centerpiece of the state's conservation efforts in 2001. It offered consumers a 20 percent rebate if they reduced consumption by 20 percent from the previous year's levels, and over 30 percent of utility customers qualified for the discounts. Finally, education and outreach programs can heighten consumer awareness of their electricity usage and disseminate information on easy methods for reducing consumption, such as shutting off a little-used spare refrigerator. Although it is difficult to disaggregate the individual

power, and with wholesale markets working more competitively, these prices are significantly lower than those reflected in current rates.

effects of the many conservation programs that were implemented concurrently, public information programs do appear to have played an important role during the crisis.

Such programs are useful because residential and business consumers are often constrained in their ability to research conservation opportunities, calculate their costs and benefits, and raise the capital for investments. Consequently, standards and well-designed incentive programs can play an important role in aiding consumers with this investment decision. Standards are also useful in that they are administratively easy to implement and can lead to relatively rapid changes in consumption patterns.

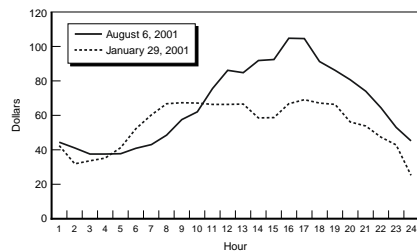
These programs, however, do have limitations. Successful programs are difficult to design. The effects of standards depend on the way technologies are used and the future prices of electricity. A major risk with standards is that they can be set too strict, at which point the added costs of efficiency enhancement outweigh the benefits of lower energy bills and reduced need for capacity expansion. Incentive programs can also be inefficiently expensive. Such programs risk rewarding consumers for actions they were already intending to make, such as buying an energy-efficient air conditioner or voluntarily reducing consumption. The 20/20 program under certain circumstances could result in payments far exceeding the costs of the saved power.<sup>2</sup> Such programs also miss conservation opportunities because regulators cannot identify every possible savings within the idiosyncratic energy-consumption patterns of residents and businesses. Most important, although these energy-efficiency programs reduce overall usage levels, they do little to change usage in response to market conditions such as at times when supplies are tight.

<sup>2</sup>A consumer who used 1,000 kWh during one month last year and received a \$100 energy bill would have to reduce consumption to 800 kWh for the same month to receive a \$20 rebate under the 20/20 program. With a voluntary reduction in consumption to 850 kWh in response to a public information campaign, participation in the 20/20 program would yield only an additional reduction of 50 kWh. In this case, the costs of added conservation are \$0.40 per kWh (a \$20 refund for a 50 kWh reduction). These costs are far above the average cost of wholesale power even during the worst months of the crisis.

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These traditional demand-management programs can be made more effective and more pervasive by expanding them to induce consumers to make consumption decisions that respond to underlying market conditions. The key to these changes is to give consumers information on the cost of power. The cost of generating power fluctuates constantly throughout the year and each day. Figure 5.1 provides an example of these fluctuations over one summer and one winter day.<sup>3</sup> These hourly and seasonal price variations are almost never passed through to consumers. Rather, they usually receive a constant average price over all hours of the day throughout the year.

Passing through these price signals to consumers offers a number of advantages over traditional conservation programs. Because power prices are highest when demand is high and supplies are short, consumers face strong financial incentives to control their usage when conservation is



SOURCE: <http://www.mis.nyiso.com/public/P-2Alist.html>.

Figure 5.1—Day-Ahead Wholesale Market Price Hourly Fluctuations for New York City

<sup>3</sup>These wholesale market prices indicate only the underlying marginal costs if power markets are fully competitive. If generators are exercising market power, these wholesale prices may overstate actual costs, but the prices in either case do correctly reflect the pattern of cost changes over time.

most valuable. Price averaging, in contrast, impedes efforts to induce consumers to manage their usage because their savings from curtailing usage in the middle of the day (when conservation is most needed) are no greater than their savings from curtailing usage in the middle of the night. The 20/20 rebate program had the same limitation in that it rewarded demand reductions during nonpeak hours as much as on-peak reductions. Unlike grants for efficiency-enhancing investments or rebates for conservation, price signals also automatically adjust to changing market conditions. Thus, if shortages develop suddenly and unexpectedly, as they did in the summer of 2000, conservation measures are put into place immediately.

The most market-oriented method to create incentives for conservation at times of peak loads is to charge consumers real-time prices that change every hour with fluctuations in the wholesale price. RTP continuously provides consumers with the correct information on the value of conservation and the incentives to carry it out. At this time, however, RTP is most appropriate for industrial and large commercial customers. They have the capacity to manage their electricity usage in real time and to hedge risks that they face as a result of price volatility. RTP also requires more sophisticated metering technology that records the time of usage. Such meters are not commonly installed at customer premises, although in 2001 California made an important step toward implementing RTP by installing 23,000 real-time meters to large customers that consume 25 percent of the peak load.

Residential and smaller businesses, in contrast, are less likely to manage their electricity consumption effectively in response to continuously changing prices. Thus, simple RTP programs are less likely to induce reasonable conservation efforts. Nevertheless, several variations of RTP programs greatly simplify the decisionmaking process, allowing smaller consumers to respond to prices more effectively. One option is interruptible rates. This program offers a discount to users who are willing to have their power curtailed occasionally when power is particularly scarce (and prices are particularly high). These programs were popular before the crisis. They fell out of favor when the number of power interruptions grew dramatically, but they continue to be a cost-effective way to manage demand. Another method is time-of-use (TOU)

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rates under which power consumed at peak times is priced at a higher level than off-peak power. Although TOU rates provide some incentive to conserve at the correct times of the day, they still fail to reflect changing day-to-day circumstances. For example, consumers would face the same peak hour TOU rate on each of the two days represented in Figure 5.1 even though the cost of generating power on the summer day is significantly higher.

The effectiveness of TOU rates can be improved by a system called critical peak pricing. In addition to the higher on-peak rates, critical peak pricing raises prices to very high levels a few days each year when the system approaches its capacity. Warnings that these higher rates will be in effect can be broadcasted the day before they occur, allowing consumers time to plan a response. One simple option during the summer would be to precool one's house in the early afternoon, before the peak prices take effect, and then turn off the air conditioner for the late afternoon hours.

One promising avenue for helping small customers to respond effectively to market prices combines real-time meters, automatic thermostat technologies, and other electronic control technologies. These technologies enable electricity service providers and consumers to automate responses to price fluctuations, thereby greatly simplifying demand management. For example, one system would offer customers a reduction in the standard tariff. In exchange, they would grant their service provider some control over their air conditioning use. On a set number of days, the provider could curtail the customer's electricity use by increasing the temperature setting for the air conditioner. It is also possible to offer customers an override feature. The customer could choose to lower the temperature but would then be charged the going market rate for power. In another situation, customers could program a set of decision rules into their thermostats: If the price of electricity is less than \$0.10 per kWh, they may wish to cool their house to 72 degrees. If the price exceeds \$0.10, the house could be allowed to warm to 76 degrees, and if the price exceeds \$0.25, the air conditioning could be automatically shut off. As the costs of these technologies decrease, the possibilities expand and virtually all household appliances could be controlled automatically according to the price of electricity.

Experiments are already being conducted with a number of these options. Much will be learned in the near future on customer acceptance of these programs and the degree to which they facilitate intelligent energy management.

Although the potential benefits of RTP and similar programs are significant in terms of improving system reliability, reducing costs, and improving efficiency, they have met with strong resistance. Consumers find these programs complex and uncertain and fear that they will result in higher overall bills. Some of these fears are based on misconceptions. Businesses that have continuous operations, requiring a constant amount of power all hours of the day, have complained that they should not be exposed to real-time prices because they cannot avoid using electricity during the expensive afternoon hours. Such businesses, however, would benefit from RTP because a smaller proportion of their total usage is during peak hours compared to the average user. Thus, the savings from the large quantities of low-priced electricity they purchase at off-peak times would outweigh the added expenses for afternoon operations.

Nevertheless, some concerns about exposing consumers to the full variability of electricity costs are real. They can lead to increased volatility in monthly bills because spot market prices vary considerably from month to month. Moreover, because consumers can take only a limited number of actions to reduce their electricity consumption, energy demand does not change significantly in response to price changes. In the summer of 2000, for example, SDG&E customers faced a 140 percent price increase, but they decreased usage by only 5 percent. Politicians may have diminished the price response by mobilizing to reregulate rates, thereby convincing consumers that the higher prices would not endure (Bushnell and Mansur, 2001). Nevertheless, studies generally find that demand responsiveness is limited. Large price swings, consequently, are required to induce changes in behavior.

This volatility can be mitigated. Automatic thermostats and control technology help by automatically reducing usage when prices are particularly high. Customers could be allowed to purchase forward and hedge contracts that could insure them from the effects of extreme price swings (Wolak, 2001). Within a regime with direct access, competitive

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service providers could offer a variety of such contracts, although the decisionmaking calculus for many consumers could prove overwhelming.

Even in the absence of retail competition, utilities could be mandated to offer RTP while maintaining bill stability by requiring that they hedge a large portion (e.g., 80 percent) of their retail load with fixed-price, long-term contracts. Customers would then be charged the hourly RTP minus the difference between the average real-time price and the utility's actual procurement costs (e.g., the costs of the long-term contracts plus the additional power purchased on the spot market) (Borenstein, 2001). For example, if the average real-time wholesale market price is \$0.15 in one month, long-term power costs \$0.10, and the utility purchased 20 percent of its power in the spot market, then the customer is charged the RTP minus \$0.04 for each kWh.<sup>4</sup> This method preserves the incentives to conserve power at system peaks because the hourly rate paid by the consumer tracks the real-time prices closely, but it also maintains average monthly bills that are close to the costs of long-term power.

A final option implemented by Georgia Power is to provide customers with a historical load profile that estimates their power usage for each hour of the day. Customers are then charged real-time prices only for deviations from this historical load profile. Customers who do not change usage patterns at all receive exactly the same bill as they did in previous years, but if they conserve (use) additional electricity at peak times, their bills are reduced (increased) by the prevailing real-time price.

Certain types of users do end up with higher bills under RTP and similar options. Consumers who consume a disproportionately large amount of energy during peak times and are unable to shift their usage patterns get stuck paying the higher peak prices. Such customers would include, for example, firms that do most of their business in the afternoon and residences that rely heavily on air conditioning, but for health or other reasons cannot curtail use at peak times. The Georgia Power policy of charging real-time prices based on deviations from historical usage patterns is one method for mitigating these harms. Education programs to help consumers understand ways to shift their

<sup>4</sup>The average cost of procurement in this example is  $\$0.11 = 0.8 \times 0.10 + 0.2 \times 0.15$ .

usage away from peak times would also reduce the scope of the problem. For the small number of users that are completely unable to change their usage patterns, targeted subsidy programs could be considered.

### Develop Comprehensive Infrastructure Planning

As California restructures the electricity sector, an important focus will be strengthening the state's capacity for comprehensive infrastructure planning. Although the crisis was driven by a shortage in electricity-generating capacity, it also revealed weaknesses with the transmission system, natural gas supply, and other related systems. Simply building additional generation plants will not solve the state's long-run problems if inadequacies with complementary systems are not addressed.

Restructuring and crisis have led to chaotic systems for monitoring, siting, and building additional transmission capacity and gas pipelines. Before restructuring, responsibilities were clearly delineated. The main utilities overseen by the CPUC built and maintained the main transmission grid, and the CEC approved connections to the grid from generating plants. With restructuring, the responsibility for improvements for the transmission system was dispersed among many agencies, allowing transmission planning to fall through the cracks. At the same time, restructuring demanded more not less attention to the transmission grid. A boom in energy trading created new flows of power over the grid that stressed a system that had been designed by vertically integrated monopolies at a time when power flows were more predictable and controlled.

Developing plans and implementing improvements to the grid is certain to be contentious and difficult. Electricity transmission remains a monopoly and, thus, it is a continuing regulatory challenge. In the ideal vision of electricity market design, wholesale market trading was to create incentives for transmission expansion. Firms would have to pay for congestion on the system, and these congestion prices would signal the need for new transmission capacity. The California market has clearly failed to provide these incentives and instead created opportunities for gaming the market (Hogan, 2001b).

Expanding transmission capacity also creates conflict by shifting the competitive landscape for generators. Generators within zones served by

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inadequate transmission links tend to receive higher prices because congestion prevents generators outside that zone from importing competitive power. Expanding capacity to such zones reduces the prices generators within the zone can charge while expanding the market for generators outside of the zone. Given the competitive stakes, transmission siting decisions can lead to protracted regulatory and legal battles. Finally, new transmission facilities face environmental hurdles because they are unsightly, and there is continuing debate on whether exposure to electromagnetic fields created by high-tension wires can cause cancer (Oak Ridge National Laboratory, 1998). To overcome these hurdles, California requires a comprehensive, coordinated, and committed transmission policy.

The state should also support research and development in methods for making California energy infrastructure more flexible and robust. Renewable forms of energy are attractive because of their environmental benefits, but they also should be examined as a method for improving the diversity of fuels on which California relies. Innovations in new forms of generation also hold promise as a way to alleviate future supply shortages and bottlenecks (Cambridge Energy Research Associates, 2001a; Cicchetti, 2001). Microturbines and fuel cells are two technologies that are beginning to be available or are in development. They are sufficiently small and efficient that large customers could become responsible for their own power. Such distributed generation can be added quickly to relieve shortages from bottlenecks in the transmission grid. In addition, micro sources of generation allow for mobile generation in which power can be moved to areas in need. By reducing the level of reserves needed to maintain system reliability and by using available transmission resources more effectively, distributed generation could enhance the efficiency of the electricity system.

#### Reorganize Policy Apparatus

Whatever direction the development of the California electricity sector takes, policymakers must reassess and reorganize the complex set of administrative structures that currently exist. Electricity sector restructuring followed by crisis has led to an ad hoc and confusing mix of state agencies and departments. Before AB 1890, California, the CPUC,

and the CEC shared primary responsibility for managing electricity policy. They regulated electricity service and rates, approved new plants, performed long-run planning, and ran energy conservation programs. The development of a competitive market for wholesale power ceded some regulatory authority to FERC. It also led to the creation of the ISO, an independent market body regulated by FERC, and a new state agency, the EOB. In the heat of the crisis, the Department of Water Resources became the default purchaser of electricity for the state, and the legislature created the California Power Authority in an attempt to regain some control over the situation.

As seen in Table 5.1, these changes have led to overlapping, confused, and conflicting authority. The California Power Authority now has planning and conservation responsibilities similar to those of the CEC and CPUC. The CPUC, CEC, DWR, and ISO all forecast energy demand and supply. Responsibility for monitoring electricity system reliability is split between the CPUC, EOB, and ISO, and the CPUC,

Table 5.1  
Selected Activities and Responsibilities of Energy-Related Agencies

Function	CPUC	CEC	CPA	DWR	ISO	EOB	FERC
Rate regulating	X						X
Promoting energy conservation and efficiency	X	X	X				
Forecasting electricity demand	X	X		X	X		
Promoting renewable resources		X	X	X			
Licensing generators		X					
Conducting integrated resource planning	X	X	X				
Monitoring the electricity market	X					X	X
Monitoring/planning system reliability	X				X	X	
Planning electricity transmission infrastructure	X	X	X		X	X	X
Planning natural gas infrastructure	X	X	X				X
Representing the state at FERC	X			X		X	

SOURCE: Adapted from California Legislative Analyst's Office (2002).

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EOB, and DWR all share the duties of managing California relations with federal regulators.

These overlaps have led to coordination and policy failures. Most notably, the division of ratemaking authority between the CPUC and FERC impeded rapid and effective policy action at the height of the crisis. After the DWR entered into \$42 billion worth of long-term power contracts, it clashed with the CPUC. The DWR demanded authority over rates to ensure that it could cover the contract costs and the bond issue to repay the state general fund for earlier electricity purchases. The CPUC, who traditionally set rates, refused to cede its authority, delaying the bond issue and costing taxpayers millions in added interest charges. The fractured responsibility over transmission projects has led to interjurisdictional turf battles and delayed much needed expansion to expand Path 15. In the wholesale power market, the new mix of state activities has given rise to potential conflicts of interest. The state through the Department of Water Resources and potentially through the California Power Authority competes with merchant generators in the wholesale market, but at the same time, it regulates these firms through other state agencies and the state's control of the ISO board.

This ad hoc structure of California energy policymaking institutions is an impediment to attaining the basic goals of the electricity sector. Administrative feasibility is hampered by the need for interagency coordination and policy implementation is impaired by confused program authority. State energy policy loses its coherence as the many, interrelated facets of energy policy—regulation of market players, market design, siting of generation and transmission, conservation, planning—are addressed in separate forums. Moreover, administrative conflict and chaos threaten the reliability and efficiency of the electricity system. Power generators may steer clear of constructing additional capacity in California if they are uncertain of the rules and regulations that will determine the returns on their investment. Similarly, consumers can become quickly confused if presented with a patchwork of differing options promoting conservation efforts.

Either an umbrella organization, such as a cabinet-level post, is required to coordinate policy or functions need to be rationalized and

centralized into fewer key agencies. The exact shape of the necessary reforms depends on the institutional course that California follows. If the state continues to manage its portfolio of long-term contracts and expands the public role in the power sector, these functions could naturally be organized within an expanded California Power Authority. If policymakers wish to return to a more regulated environment, the CPUC would be the natural agency in which to centralize functions. In contrast, if the state wishes to forge ahead with a private, deregulated market, a new agency or a stripped-down version of an existing one could focus on a more limited set of regulatory functions, such as plant approval, conservation promotion, and market oversight.

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### 6. Conclusions

The brunt of the electricity crisis has passed. The direst predictions for the “perfect storm” of the summer of 2001 did not come to pass, and recent additions to generating capacity appear to provide adequate supplies for the near future.

The California electricity sector, nevertheless, remains in serious condition. California businesses and consumers will be burdened with the costs of the crisis for years to come, placing a drag on the state’s economy. The medium-term supply situation is also tenuous. Falling wholesale power prices combined with the fallout from the Enron bankruptcy have dried up the supply of investment capital available to fund power projects. As a result, merchant generators have cancelled or delayed thousands of megawatts of planned construction. These cancellations leave the state vulnerable to future supply shortfalls if there is a repeat of extreme weather conditions or demand grows rapidly because of slackening conservation efforts or unexpectedly strong economic growth. The most serious point is that California electricity policy remains adrift, lacking a long-run vision of how to move beyond the debacle of 2001.

The crisis did provide policymakers with some hard-earned lessons:

- **Electricity market design is fraught with difficulties.** The high costs of reliability failures and the need to balance supply and demand in real time greatly complicate the coordination of multiple players through bidding processes. Although there is no broad consensus on the optimal electricity market design, California clearly had significant deficiencies.
- **Heavy reliance on wholesale spot markets is extraordinarily risky.** As in other commodity markets, spot prices are very sensitive to shifts in underlying supply and demand conditions, at times leading to extreme volatility. In times of tight supply,

spot markets work particularly poorly, giving generators opportunities to flex their market power.

- **Fragmented regulatory authority impedes effective policymaking.** The division of regulatory authority between FERC, which controls wholesale rates, and the CPUC, which controls retail rates, was a recipe for confusion, blame shifting, and eventually disaster. More generally, the multiplication of electricity-related agencies led to duplication, confusion, and conflict in policymaking.
- **Competitive markets require behavioral adjustments.** During the implementation of AB 1890, regulators, utilities, and consumers were all slow to recognize the risks and opportunities created by restructuring. Regulators continued to focus on administrative oversight instead of facilitating competition, stalling the development of the retail market and impeding contracting by the utilities. The utilities failed to protect themselves from the risks they faced in the wholesale market. Consumers did not aggressively seek out new options for their electricity needs, preferring to remain passive consumers of electricity. Because these central actors continued to operate as if the stable and secure rules of regulation still held, they were woefully unprepared for the original price spikes in 2000, greatly exacerbating the extent of the crisis.

Much has already been done to address the most glaring causes of the California crisis. The long-term contracts signed by California, although expensive, have bought a measure of stability by reducing exposure to the spot market. New generation and conservation programs have eased the tight supply situation California faced, and market mitigation measures, including regional price caps imposed by FERC, have helped to reduce the threat of market power. Continued vigilance is needed, however. The exact causes of the crisis remain controversial, and because multiple, intertwined factors were simultaneously at work, it remains uncertain whether all the root causes of the crisis have been addressed. To ensure no repeat of the winter of 2001, policymakers will need to exercise caution as they contend with lingering uncertainties.

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The most significant challenge facing policymakers is the need to develop a long-range plan for the California electricity sector. Because of the extent of the damage the crisis inflicted on market and policymaking organizations, California begins with nearly a clean slate. Policymakers can take the sector in a range of directions. They can increase the role of public ownership, or they can return to a more orderly world with regulated, vertically integrated monopolies. Alternatively, they can continue down the restructuring path that was interrupted by the crisis. Hybrid options include rebuilding the competitive wholesale market but with continued regulation of retail sales or only limited extension of retail competition to large industrial and commercial users.

The main tradeoff posed by these options is between the greater reliability and stability of regulated markets versus the efficiency gains and potentially lower costs made possible by competition. After enduring the crisis, the stability of regulation seems attractive. Nevertheless, competition has worked in other states and countries, and the advance of ever more efficient generation technology makes increasingly market-oriented policies inevitable at least in the generation sector. Effective deregulation, however, requires that California coordinate with federal regulators to develop a set of effective policies to prevent the exercise of market power.

As policymakers develop and implement a long-range vision, they should focus on a number of specific concerns:

- **Forge an early consensus.** Ambiguity and conflict concerning the future direction of California's electricity sector lead to market uncertainty. California risks repeating history if continued uncertainty stifles investment in critical infrastructure, leading to future shortages. Agreement on the broad outlines of a regulatory and market structure, even without the details specified, would do much to improve the investment environment.
- **Avoid the allure of quick gains.** The real benefits from competition do not accrue rapidly. It takes many years to improve the mix of operating plants, improve their operation, and develop more intelligent consumption patterns. In the early

years of the California restructuring experiment, actors focused excessively on reaping the gains of low wholesale rates. As a consequence, they failed to build the foundations of successful competitive markets, including retail competition, and left California exposed to the grave risks of the spot market.

Pursuing quick fixes to California's current electricity woes risks again diverting attention from important fundamental reforms.

- **Improve demand management.** Expanding and institutionalizing demand-management programs is critical to making California's electricity sector more robust. Helping consumers make more intelligent consumption decisions can lower energy bills, improve efficiency, and help the environment. In addition, more active consumers of electricity facilitate a future transition to competition by increasing the benefits they can achieve from a wider selection of electricity offerings.
- **Reorganize the administration of energy policy.** Developing a post-crisis electricity sector will require a coordinated, comprehensive, and effective set of policies. The current set of electricity-related agencies, with their overlapping, conflicting, and ambiguous roles, are not up to this task.

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Appendix

The Effect of Price Caps on Firms  
Exercising Market Power

As shown in Figure A.1, the common textbook example of rent control illustrates the adverse effects of a regulatory-imposed cap on prices,  $P_{cap}$ , in a perfectly competitive market. If left unregulated, this market will reach an equilibrium in which  $P^*$  is the market clearing price and  $Q^*$  units are sold. If  $P_{cap}$  is set below the market clearing price,  $P^*$ , suppliers reduce the amount they are willing to offer to the market from  $Q^*$  to  $Q_{supplied}$  and consumers react to the lower price by increasing their demand to  $Q_{demanded}$ . The cap, thus, creates a shortage in the market equal to  $Q_{demanded} - Q_{supplied}$ . Assuming that this model of a competitive market correctly describes the California electricity market, the implication is that imposing caps would lead to blackouts, as generators would not be willing to supply all the electricity demanded at the capped prices.

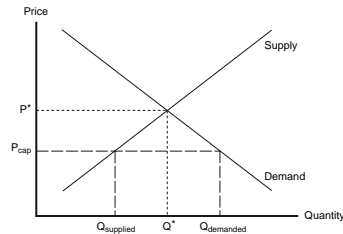


Figure A.1—Price Caps in a Competitive Market

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A critical point largely missing from the debate is that *when firms are exercising market power*, this simple model does not apply, and price caps do not have this undesirable effect. As shown in Figure A.2, when a firm exercises market power, its marginal revenue—the increase in its revenues from selling one more unit of its product (e.g., a kilowatt hour of electricity)—is less than the current market price. This occurs because to attract one more buyer the firm has to lower its price. By making the additional sale, the firm earns the new (lower) market price for that unit, but at the same time, it is forced to accept lower revenues from all the units that it was already selling at the higher price. Consequently, the firm's marginal revenue curve is below the demand curve it faces. To maximize profits the firm will continue lowering (increasing) price and increasing (decreasing) sales until its cost for the last unit sold (e.g., its marginal cost or the supply curve) equals the marginal revenue earned for that last unit. Thus, a firm exercising market power will offer  $Q_{market\ power}$  units on the market and charge a price of  $P_{market\ power}$ . If the firm did not exercise market power, it would offer  $Q^*$  units and charge a price of  $P^*$ . Consequently, a firm with market power sells fewer units and charges a higher price than a firm operating in a perfectly competitive market.

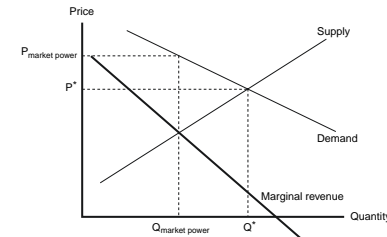


Figure A.2—Effect of Market Power

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When a firm is exercising market power, a price cap,  $P_{cap}$ , changes the shape of its marginal revenue curve. Because it is no longer able to increase the price above the level of the cap, the cap determines the additional revenue it can earn from selling added units. As shown in Figure A.3 the cap flattens out the marginal revenue curve at the level of the cap. At the point that the cap intersects the demand curve, the marginal revenue drops down to the original level because the firm is again required to reduce the price of all units already sold to sell additional units. The firm then faces the new marginal revenue curve represented by the bold line. To maximize profits, the firm will sell all units for which the marginal revenue it earns exceeds its costs. Thus, it will produce  $Q_{cap}$  units, increasing output and lowering prices compared to the market outcome when it exercises market power.

Price caps remain a blunt policy instrument. Regulators can replicate the benefits of a perfectly competitive market only if the cap is set exactly to  $P^*$ , the equilibrium price under competition. The optimal, competitive price, however, is constantly changing with shifts in demand and supply conditions. Regulators have neither the information concerning market conditions nor the administrative capacity necessary to track these shifts. Thus, under typical circumstances, policies that promote vigorous

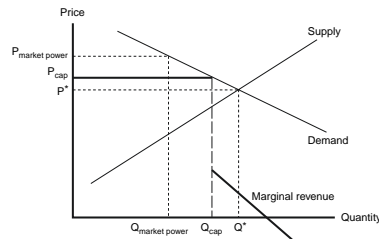


Figure A.3—Effect of Price Cap on Producers Exercising Market Power

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competition in electricity markets have strong advantages over price caps in the long run. In contrast, price caps have advantages as a short-run policy when electricity supplies are tight enabling firms to exercise market power.

Even imperfect price caps can improve market outcomes and are not likely to exacerbate the problem. If the cap is set above the current market price,  $P_{market power}$ , then it has no effect, positive or negative, on market outcomes. As seen in Figure A.4, even price caps set below the optimal price,  $P^*$ , can improve market outcomes. The firm will produce  $Q_{cap}$  units, the point at which its costs equal the amount of the price cap. Although this result is not as efficient as the competitive market outcome, price caps increase the supply and lower the price of the good compared to the situation where market power goes unchecked. The one situation in which price caps do cause harm is if they are set below the current marginal costs of producers exercising market power ( $MC_{market power}$  in Figure A.4). In this case, the price cap would reduce market supply and exacerbate shortages. In sum, when firms are exercising market power, regulators can improve market outcomes by setting any cap level between  $MC_{market power}$  and  $P_{market power}$ . Although setting such a cap remains a difficult regulatory task, it is significantly less onerous than determining the optimal cap level.

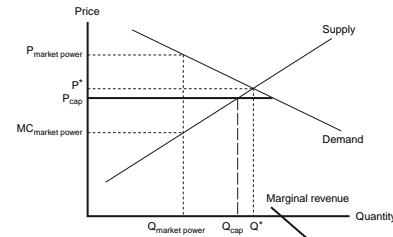


Figure A.4—Effect of Price Cap Below Competitive Level on Producers Exercising Market Power

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## References

- Bay Area Economic Forum, *The Bay Area—A Knowledge Economy Needs Power*, San Francisco, California, 2001a, pp. 1–74.
- Bay Area Economic Forum, *California at a Crossroads: Options for the Long-Term Reform of the Power Sector*, San Francisco, California, 2001b, pp. 1–56.
- Bay Area Economic Forum, *The Economics of Electric System Municipalization*, San Francisco, California, October 2001c, available at <http://www.bayeconfor.org/pdf/ElectricMuni.pdf>.
- Borenstein, S., *The Trouble with Electricity Markets (and Some Solutions)*, Program on Workable Energy Regulation, University of California, Berkeley, 2001.
- Borenstein, S., J. B. Bushnell, et al., *Diagnosing Market Power in California's Deregulated Wholesale Electricity Market*, University of California Energy Institute, Berkeley, 2001.
- Brown, R. E., and J. G. Koomey, *Electricity Use in California: Past Trends and Present Usage Patterns*, Lawrence Berkeley National Laboratory, Berkeley, California, 2002.
- Bushnell, J. B., and E. T. Mansur, *The Impact of Retail Rate Deregulation on Electricity Consumption in San Diego*, University of California Energy Institute, Berkeley, 2001.
- Bushnell, J. B., and C. Saravia, *An Empirical Assessment of the Competitiveness of the New England Electricity Market*, University of California Energy Institute, Berkeley, 2002.
- California Energy Commission, *Previous Energy Commission Peak Electricity Demand Forecasts*, California Energy Commission, 2001.
- California Energy Commission, *The Summer 2001 Conservation Report*, California Energy Commission, 2002a.

- California Energy Commission, *Power Plant Projects Recently Approved*, 2002b.
- California Legislative Analyst's Office, *The 2002–03 Budget Bill: Perspectives and Issues—Reorganizing California's Energy-Related Activities*, Sacramento, California, 2002, available at [http://www.lao.ca.gov/analysis\\_2002/2002\\_pandv/pi\\_part\\_5b\\_energy\\_an201.html](http://www.lao.ca.gov/analysis_2002/2002_pandv/pi_part_5b_energy_an201.html).
- California State Auditor, *Energy Deregulation: The Benefits of Competition Were Undermined by Structural Flaws in the Market, Unsuccessful Oversight, and Uncontrollable Competitive Forces*, Sacramento, California, 2001a.
- California State Auditor, *Energy Deregulation: The State's Energy Balance Remains Uncertain but Could Improve with Changes to Its Energy Programs and Generation and Transmission Siting*, Sacramento, California, 2001b.
- Cambridge Energy Research Associates, *Beyond California's Power Crisis: Impact, Solutions, and Lessons*, Cambridge, Massachusetts, 2001a.
- Cambridge Energy Research Associates, *Short Circuit: Will the California Energy Crisis Derail the State's Economy?* UCLA Anderson Business Forecast, Los Angeles, California, 2001b.
- Cicchetti, C., personal communication, University of Southern California, 2001.
- Edison International Corporation, *2000 Annual Report*, Rosemead, California, 2001.
- Federal Energy Regulatory Agency, *Market Order Proposing Remedies for California Wholesale Electric Sales*, Washington, D.C., 2000, pp. 1–77.
- Federal Energy Regulatory Commission, *Report on Plant Outages in the State of California*, Office of the General Counsel, Market Oversight and Enforcement and the Office of Markets, Tariffs and Rates, Division of Energy Markets, Washington, D.C., 2001.
- Friedman, L. S., and C. Weare, "The Two-Part Tariff, Practically Speaking," *Utilities Policy*, January 1993, pp. 62–80.
- General Accounting Office, *Energy Markets: Results of Studies Assessing High Electricity Prices in California*, Washington, D.C., 2001.

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Harvey, H., B. Paulos, et al., *California and the Energy Crisis: Diagnosis and Cure*, Energy Foundation, San Francisco, California, 2001, pp. 1–12.

Harvey, S. M., and W. W. Hogan, *On the Exercise of Market Power Through Strategic Withholding in California*, Center for Business and Government, JFK School of Government, Harvard, Cambridge, Massachusetts, 2001, pp. 1–76.

Hogan, W. H., *Electricity Market Power Mitigation*, Center for Business and Government, JFK School of Government, Harvard, Cambridge, Massachusetts, 2001a, pp. 1–23.

Hogan, W. H., *Electricity Market Restructuring: Reforms of Reforms*, Center for Business and Government, JFK School of Government, Harvard, Cambridge, Massachusetts, 2001b, pp. 1–29.

Joskow, P., “Deregulation and Regulatory Reform in the U.S. Electric Power Sector,” in S. Peltzman and C. Winston, eds., *Deregulation of Network Industries: What’s Next?* AEUI-Brookings Joint Center for Regulatory Studies, Washington, D.C., 2000, pp. 1–201.

Joskow, P., *California’s Electricity Crisis*, Massachusetts Institute of Technology, Cambridge, Massachusetts, 2001.

Joskow, P. L., and E. Kahn, *Identifying the Exercise of Market Power: Refining the Estimates*, Cambridge, Massachusetts, 2001a.

Joskow, P. L. and E. Kahn, *A Quantitative Analysis of Pricing Behavior in California’s Wholesale Electricity Market During the Summer of 2000*, National Bureau of Economic Research, Cambridge, Massachusetts, 2001b.

Kiesling, L., *Getting Electricity Deregulation Right: How Other States and Nations Have Avoided California’s Mistakes*, Reason Foundation, Los Angeles, California, 2001.

Kumbhakar, S. C., and L. Hjalmarsson, “Relative Performance of Public and Private Ownership under Yardstick Competition: Electricity Retail Distribution,” *European Economic Review*, Vol. 42, 1998, pp. 97–122.

Kwoka, J. E., *Power Structure: Ownership, Integration, and Competition in the U.S. Electricity Industry*, Kluwer Academic Publishers, Boston, Massachusetts, 1996.

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McNamara, W., “FERC Enacts Major Constraints on Wholesale Market,” *Scientech*, 2001a.

McNamara, W., “Five Reasons Why U.S. Deregulation May Be Stagnating (And Enron Isn’t One of Them),” *Scientech*, 2001b.

Mowris, R., *California Energy Efficiency Policy and Program Priorities*, California Board for Energy Efficiency, Rosemead, California, 1998.

Oak Ridge National Laboratory, *Questions and Answers about Electric and Magnetic Fields Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences, 1998.

Peltzman, S., and C. Winston, eds., *Deregulation of Network Industries: What’s Next?* AEUI-Brookings Joint Center for Regulatory Studies, Washington, D.C., 2000.

Ross, S. A., *An Energy Crisis from the Past*, Institute for Governmental Studies, University of California, Berkeley, 1974.

Smith, D., “California Audit Finds Power-Plant Approvals by Energy Panel Often Delayed,” *Sacramento Bee*, Sacramento, California, 2001.

Tucker, D. M., “California Officials Hope to Keep Averting Power Crisis,” *The Business Press*, Ontario, California, 2002.

USC School of Policy Planning and Development, *Electricity Deregulation, Neo-Regulation, and Re-Regulation: What’s Next?* University of Southern California, Los Angeles, 1999.

Vogel, N., “The California Energy Crisis; Cal-ISO Predicts 34 Days of Blackouts; Power: The Summer Could Be Filled with Rolling Outages If Consumers Don’t Cut Consumption from Last Year’s Levels, Officials Warn,” *Los Angeles Times*, 2001, p. 26.

Wolak, F. A., *Designing a Competitive Wholesale Electricity Market That Benefits Consumers*, Stanford University, Palo Alto, California, 2001.

Wolfram, C., “Measuring Duopoly Power in the British Electricity Spot Market,” *American Economic Review*, Vol. 89, 1999, p. 805.

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## About the Author

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### CHRISTOPHER WEARE

Christopher Weare is a research fellow at the Public Policy Institute of California. He has worked on the regulation of telecommunications, financial markets, and the electricity sector, focusing on the tradeoffs between efficiency and other goals. He is also researching the effects of information and communication technologies on local governance and citizen political participation. Before coming to PPIC, he was an assistant professor at the Annenberg School for Communication at the University of Southern California and a visiting assistant professor at the University of California, Berkeley. He also spent one year as a Congressional Fellow in the U.S. House of Representatives. He holds a B.A. in government from Harvard College and a Ph.D. in public policy from the University of California, Berkeley.

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State Capitol  
Sacramento, California 95814



California Assembly Utilities and Commerce Committee  
&  
Joint Legislative Committee on Emergency Management  
Briefing Paper on September 8, 2011 Southwest Power Outage

**Abstract**

This paper discusses the operation of the transmission system with respect to the Southwest Power outage and power restoration, and community emergency management, wireless communication system, and wastewater treatment facility response to the blackout.

**I. Introduction**

On September 8, 2011 a power outage occurred that affected approximately 1.4 million electricity customers (4 to 5 million people) in California, Arizona, and Mexico. The outage began around 3:30 p.m. Power was restored in some areas within 4 hours and all power was restored within 12 hours.

The cause of the outage has been attributed to work being performed on a 500-kilovolt transmission line located in Yuma, Arizona at or near the North Gila Substation operated by Arizona Public Service (APS). The North Gila Transmission line serves APS, Imperial Irrigation District (IID), and San Diego Gas & Electric (SDG&E) customers – the latter two of which are both in California. However, it is not clear if the work on the transmission line was a single event or one of a number of other events that caused the outage to spread throughout the affected area.

Specific to California, the outage impacted all customers of SDG&E and some customers of IID and parts of Southern California Edison (SCE) service areas in some parts of Orange and Riverside Counties.

Various critical infrastructure problems occurred during the outage, primarily involving waste water treatment facilities and wireless communication systems. Nearly 3.5 million gallons of sewage was released into the Los Penasquitos Lagoon and the Sweetwater Channel near the San Diego Bay and two wildlife preserves.

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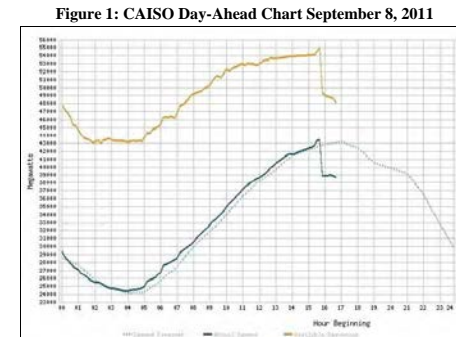
Local businesses lost revenues or revenue opportunities during the outage. For those businesses with products that rely on refrigeration, some inventory losses may also have occurred.<sup>1</sup>

During the outage, community emergency response plans were put into effect. San Diego Mayor Jerry Sanders issued precautionary 'boil water' alerts to local citizens within 13 areas of San Diego from possible adverse health affects related to consuming contaminated drinking water. SDG&E performed welfare checks on customers who are on medical accounts and provided frequent updates on the outage and efforts to restore power.

**II. Losing power and Restoring Power**

Figure 1 illustrates the total power available throughout the California Independent System Operator (CAISO) region on the day of the outage. The upper line shows total available generation and the lower line shows actual real time demand for electricity within CAISO's region. The outage is clearly visible when the lines in the graph drop at roughly 1530 in the afternoon. While the graph shows that there was adequate generation to meet demand, this graph does not provide information on what was going on in the regions neighboring CAISO. It has been reported that Imperial Irrigation District, which is a neighboring region to CAISO, was at a near-record day for electricity demand at the time of the outage.

Figure 1: CAISO Day-Ahead Chart September 8, 2011



<sup>1</sup> SDG&E has a web page for customers to submit a claim for damages due to the September 8, 2011, power outage, pending the results of the investigations currently on-going. SDG&E is not assuming responsibility for any losses incurred as a result of the power outage. Once the investigations have been completed the SDG&E Claims Department will contact claimants. <http://www.sdge.com/customer/claims.shtml>

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When the Arizona transmission line went out of service, power flows increased over other transmission lines connected to the same transmission system.

Transmission systems throughout the United States are managed by "Balancing Authorities."<sup>2</sup> For example, the California Independent System Operator and the Western Area Power Administration are Balancing Authorities. Some, but not all, utilities, such as the Imperial Irrigation District also serve as a Balancing Authority. Balancing authorities analyze generation and transmission schedules submitted a day in advance to manage or avoid real-time bottlenecks in the flow of electricity within a prescribed regional boundary comprised of generation, transmission, and electricity loads.

California has six Balancing Authorities. However, there are other Balancing Authorities within the Western Region some of which were also affected by the Southwest Outage. Table 1 shows a list of the Western region Balancing Authorities. No fewer than five of the 35 Western Balancing Authorities were involved in or affected by this outage. While the topic of this hearing is the Southwest Outage, it is not clear whether or not other interdependencies exist in these other regions that could expose Californians to widespread outages again in San Diego or elsewhere in California.

**Table 1: Western Region Balancing Authorities**

<p><b>WECC-AZNMSNV (Arizona, New Mexico, Southern Nevada) Number of Balancing Authorities: 11</b></p> <p>Arizona Public Service Company, AZPS DECA, LLC - Arlington Valley, DEAA El Paso Electric Company, EPE Gila River Maricopa Arizona, GRMA Harquahala L.L.C. HGMA Imperial Irrigation District, IID Nevada Power Company, NEVP Public Service Company of New Mexico, PNM Salt River Project, SRP Tucson Electric Power Company, TEPC Western Area Power Administration - Lower Colorado WALC</p>
<p><b>WECC-CAMX (California Mexico) Number of Balancing Authorities: 5</b></p> <p>California Independent System Operator CISO Comision Federal de Electricidad CFE Los Angeles Department of Water and Power LDWP Sacramento Municipal Utility District SMUD Turlock Irrigation District TID</p>

<sup>2</sup> In the San Diego Region the transmission system is managed by the CAISO and the IID. In this region of California, other Balancing Authorities were also involved in managing the transmission system. This includes Comision Federal de Electricidad (CFE) in Mexico, Arizona Public Service in Arizona, and Western Area Power Administration in Colorado covering parts of Arizona.

<p><b>WECC-NWPP (Northwest Pacific) Number of Balancing Authorities: 17</b></p> <p>Alberta Electric System Operator AESO Avista Corp. AVA Bonneville Power Administration BPAT British Columbia Transmission Corporation BCHA Idaho Power Company IPCO NorthWestern Energy NWT PacifiCorp-East PACE PacifiCorp-West PACW Portland General Electric Company PGE PUD No. 1 of Chelan County CHPD PUD No. 1 of Douglas County DOPD PUD No. 2 of Grant County GCPD Puget Sound Energy PSEI Seattle Department of Lighting SCL Sierra Pacific Power Company SPPC Tacoma Power TPWR Western Area Power Administration - Upper Great Plains West WAUW</p>
<p><b>WECC-RMPA Number of Balancing Authorities: 2</b></p> <p>Public Service Company of Colorado PSCO Western Area Power Administration - Colorado-Missouri WACM</p>

Information systems within each balancing authority reported the change in power flows. Power flows increased to levels that were not scheduled and ultimately, reached levels that were at, or in excess of, safety standards. SCE's San Onofre Nuclear Generation Station (SONGS) was safely taken offline. When SONGS went offline it had the effect of keeping the outage from spreading further throughout California. In addition, a power plant operated by the Comision Federal de Electricidad (CFE) in Mexico was also taken offline.

To restore power, balancing authorities available generators, and utilities established new paths for electricity to flow via other transmission lines. It is not clear if the amount of time needed to restore power could have been lessened by better transmission equipment or communication systems within the various balancing authorities.

### *Reliability Oversight and Investigating this Event*

The Western Electricity Coordinating Council (WECC) provides coordination among the western regional Balancing Authorities in order to maintain a reliable electric power system in Western North America. Table 1 provides insights into the outage issue to the extent that California electricity reliability is affected by unanticipated events that may occur in a Balancing Authority that is not only not in California but may not have communicated with California Balancing Authorities with respect to maintenance or unexpected outage events that may be occurring that could or would impact California. Three of the Balancing Authorities involved in this outage were from the WECC-CAMX group and two were from the WECC-AZNMSNV group of Balancing Authorities. According to the California Public Utilities Commission (CPUC) the various balancing authorities involved with this outage do not regularly communicate with each other.

With regard to reliability of the electricity deliveries, reliability oversight of transmission systems has been delegated by the Federal Energy Regulatory Commission (FERC) to the North American Reliability Corporation (NERC). NERC has delegated regional reliability authority to

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

the Western Electricity Coordinating Council (WECC) for the Western United States. WECC has established reliability standards for entities within its region. One of the reliability rules is referred to as "N minus 1" which would require that a Balancing Authority be able to maintain reliability in the event that one part of the system fails (such as a transmission line or a generation facility).

Among other rules, WECC rules allow formation of 'reserve sharing groups' (RSG) which: "decrease the required level of contingency reserve carried by each member of an RSG by effectively coordinating the use of a pool of generation resources, thereby lowering the cost for all members. The allocation of contingency reserves to RSG members is based on the contracts within each RSG. Under most circumstances, when a Balancing Authority implements a reserve sharing event, it calls on reserves from other RSG members to replace a sudden loss of generation."

It is currently not known if the reserve sharing arrangements played a role in the inability of the various entities to continue to provide power.

Overlapping investigations are underway into the cause of the outage. These include:

- a) CAISO. The CAISO has established a task force to investigate the cause of the event. Members of the CAISO task force are: WECC, APS, SDG&E, IID, CAISO, CFE, SCE, and the Western Area Power Association (WAPA).
- b) FERC and NERC. In addition, FERC and NERC are conducting an investigation. In addition to the parties named in the CAISO task force, the FERC inquiry will include the CPUC and the Arizona Corporations Commission.<sup>3</sup>

While it is clear that these investigations will examine the cause of the outage, it is not clear whether the investigations will examine the steps taken to restore power to determine whether there are lessons learned that could have shortened the duration of the outage. It is also not clear if the examinations will look beyond this incident to determine whether there are other groupings of Balancing Authorities that might present potential for disruptions due to transmission and generation configurations that flow among and between various Balancing Authorities. This would be important to examine this both California itself and other regions. It is also not clear whether these reports will be made public or available to the Legislature for examination and ongoing analysis.

It may be relevant to reflect on the elimination of the California Electricity Oversight Board (EOB) along with all of its duties. The EOB was established as part of California's effort to restructure the electricity market in 1996. The goal of the EOB was to ensure that wholesale energy markets and the electric transmission system function reliably and provide electricity at fair costs to California's consumers and businesses. Governor Schwarzenegger eliminated the EOB on the basis that CAISO has developed extensive procedures for market oversight, and the CPUC has intervened with Federal Energy Regulatory Commission on market oversight issues. The EOB ceased operations on April 1, 2008. It is not clear that transmission reliability oversight was specifically transferred to either the CPUC or the Energy Commission.

<sup>3</sup> The Arizona Corporations Commission is the State's oversight agency for Arizona utilities.

Additional investigation may be warranted to determine whether California has adequate oversight of electricity reliability that might make California vulnerable to widespread outages that result from manmade or natural events within Balancing Authorities that are not located in California.

### III. Reliability of Wireless Communication Systems

The Joint Legislative Committee on Emergency Management held an informational hearing on the topic of emergency communications one month before the Pacific Southwest Outage occurred. At this hearing, wireless carriers, including AT&T, were clear in their assertion that the cellular network is not designed for everybody who has a cell phone in a specific region to use it at the same time.

According to AT&T, hundreds of cell phone towers in San Diego County shut down when the outage hit the region. AT&T was able to bring the towers back on line by bringing in generators, fuel, and technicians to restore service. Within six hours, about 99 percent of the towers were back in operation. AT&T landline service was unaffected.

Other carriers (Cricket, Verizon, Sprint, Nextel) saw almost no failures. Cricket reportedly was in the process of deploying generators when power was restored.

Usage spikes (voice and text) occurred around the time of the outage and then slowly dropped.

While it is not possible to provide a system that has no outage vulnerabilities, it is clear that the wireless industry can and should be taking steps to be prepared for, and respond in a timely manner to, outages caused by natural or manmade causes. For example, wireless service providers have developed mobile cell and satellite equipment, which can be deployed into and around an affected region in the event that a communication system failure occurs.

At the August hearing, representatives from AT&T asserted that, "given the shared nature of the wireless network, operators must design the networks to handle anticipated traffic loads." While one could not have predicted or "anticipated" the Pacific Southwest Outage, the San Diego region in particular has experienced its share of emergencies throughout the past ten years. It is a reasonable expectation then, that redundancy of wireless capabilities would be a high priority in this area.

The Federal Communications Commission (FCC) currently has an open proceeding investigating reliability and continuity of communication networks. This proceeding began in April 2011 conduct a comprehensive examination of the reliability, resiliency and continuity of communications networks to provide service during major emergency (natural or man-made) and to consider whether standards are needed to ensure adequate service levels to meet public safety and/or critical infrastructure needs. This investigation is comprehensive, looking at all aspects of communication networks, including wireless, broadband, and voice over internet systems. It is examining the extent to which service providers provide and plan for continuity of service (including placement of personnel and equipment in the event of an unanticipated need to restore service); whether or not backup power or alternatives to backup power are adequate to address timely service restoration; and system redundancy to improve reliability. The FCC is also

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

examining the extent to which public safety, commercial entities, and utilities rely upon these communication systems. Capacity and overload issues as well as maintenance procedures and failure types are also being examined. The FCC will also take comments on what actions, if any, the FCC should take to foster improved performance and reliability. There is no information available on when the FCC will make its final recommendations.

According to the National Institute of Health, wireless-only households continue to grow:<sup>4</sup>

"Preliminary results from the July–December 2009 National Health Interview Survey (NHIS) indicate that the number of American homes with only wireless telephones continues to grow. One of every four American homes (24.5%) had only wireless telephones (also known as cellular telephones, cell phones, or mobile phones) during the last half of 2009—an increase of 1.8 percentage points since the first half of 2009. In addition, one of every seven American homes (14.9%) had a landline yet received all or almost all calls on wireless telephones."

Ronald Lane, Director of San Diego County's Office of Emergency Services asserted at the August hearing of the Joint Committee, that 17% of homes in the San Diego region have no land line.

Some land line providers do provide a free low dial tone service for citizens to have access to a phone that will be able to call 9-1-1 in the event of an emergency. It is not clear how much this service is available or publicized by the land line providers in California.

A key "take-away" from the August hearing of the Joint Legislative Committee on Emergency Management was that additional public education was needed on both the parts of government agencies (i.e. emergency managers) and the wireless companies to inform the public of two things:

- Maintaining a land line is an important aspect of emergency preparedness that will allow for residents and families to remain in contact with loved ones and emergency personnel during prolonged disasters (in which power may be out for days at a time, which would reduce the ability to use cellular phones that have expired their battery life).
- During a disaster, people should make one or two calls to loved ones to verify their safety, and then refrain from using their cellular device to avoid contributing to a collapse of the system.

In the wake of the Pacific Southwest Outage, it is clearer than ever that a public education campaign on this topic is vital to the state's ability to function during an emergency.

#### **IV. Backup Power for Pumps Providing Drinking Water and Wastewater Facilities**

According to a September 22, 2011 report provided to the Public Utilities Department of the City of San Diego, the San Diego water and wastewater system was able to deliver uninterrupted

<sup>4</sup> Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July–December 2009, Stephen J. Blumberg, Ph.D., and Julian V. Luke, Division of Health Interview Statistics, National Center for Health Statistics

potable water service to over 90% of its customers and treated over 97% of the sewage discharged to the system<sup>5</sup>.

#### *Water System*

Thirteen areas in the City of San Diego lost water service as a result of not having emergency generators for the pumping stations. As a result, the City issued a precautionary order to boil water or use bottled water in those areas. At no time was the water system compromised (confirmed by water quality testing).

#### *Sewage System*

When all electrical power was lost, two of San Diego City's pump stations (Pump Station 1 and Pump Station 64) associated with the regional wastewater treatment plants spilled approximately 2.6 million gallons of sewage into Los Peñasquitos Creek and approximately 870,231 gallons of sewage into Sweetwater Bay. Beaches and parks 5 miles north and south of the mouth of Los Peñasquitos Lagoon were closed and daily water sampling began on September 9, 2011. Beaches were reopened on September 14, 2011. Warning signs are posted while testing continues to warn individuals who may have contact with the water or the fish in the area. A bio-assessment is currently underway and two follow up assessments are planned for 3- and 6-month following to address the extent of any ongoing adverse impacts.

Voluntary standards from the Office of Water Program Operations at the Environmental Protection Agency recommend separate and independent sources of electrical power from either two separate utility substations or one substation and a generator. Both of the pump stations that failed had independent sources of power from two separate utility substations. The City contacted SDG&E regarding deployment of mobile generators to the pump stations. Power was restored before they were delivered. It is unclear whether SDG&E had a generator large enough to power either of the pump stations.

#### *Generators for Backup Power Supply*

It not clear whether generator transfer switches at the electrical service equipment for the drinking water or wastewater stations were equipped with. A transfer switch provides a safe method of connecting a generator to electrical service equipment. Without a transfer switch it would require substantial time and labor to connect a generator to the station.

SDG&E has recently acquired 31 emergency portable generators of varying sizes (100kW to 800kW) to help support critical infrastructure during disasters, fires and other emergencies<sup>6</sup>. The San Diego County Office of Emergency Services (OES) has a list of these generators should they be needed during a region-wide emergency (water, sewer, telecom, evacuation center, etc.). SDG&E relies on County OES or a similar responsible agency to make the request for use of the

<sup>5</sup> Impacts of the September 8, 2011 Countywide Blackout of the Public Utilities Department, September 22, 2011, City of San Diego Public Utilities Department.

<sup>6</sup> SDG&E emphasizes that its portable generators are not intended to take the place of prudent emergency preparedness and planning. Customers that require 24/7 uninterrupted power such as hospitals, water and wastewater utilities and communications should have permanent back-up emergency generation.

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portable generators. For example, during the 2003 wildfires, SDG&E deployed a generator to the Ramona Water District.

### V. Citizen Preparedness

As a result of the widespread fires that the San Diego Community has suffered throughout the past decade, it is likely that of all regions in California, the San Diego citizenry should be best prepared for an emergency such as a power outage lasting for up to 12 hours. The California Emergency Management Agency (CalEMA) recommends preparing for a minimum of 72 hours of self-sufficiency in the event of a serious crisis.<sup>7</sup>

From all newspaper accounts, it appears that most citizens were able to manage through the outage without any serious or widespread problems (health emergencies, public safety, crime, food). The local citizens acted responsibly, heeded the warnings of emergency responders, and provided support to each other throughout the event.

Mayor Sanders was in contact with SDG&E, and San Diego's police and fire departments, and activated the region's emergency operation center accordingly. In addition, the Mayor advised the community to minimize use of landlines and cell phones and restrict travel to emergency purposes only.

SDG&E deployed nearly 200 workers to provide welfare checks on medical and life support to customers not reachable by phone. Workers knocked on over 1,800 doors both during and after the outage to ensure their customers' safety. They also utilized other communication channels such as Twitter, email and their website to provide updates. In addition, SDG&E coordinated with government emergency responders during the incident to provide information on the extent of the outage and updates on progress toward restoring power.

SDG&E worked with media at the local, state and national level providing live interviews, outage/restoration information, and safety information. Police, sheriff and fire departments were also updated regularly and local, state and federal elected officials were briefed throughout and after the event.

The San Diego Police Department reported no major incidents, no increase in violence and remained fully operational receiving 911 calls and dispatching services during the outage.

That said several media outlets covered allegations that students at California State University, San Diego (San Diego State University, or SDSU) were asked to leave the dormitories on campus during the outage. According to the *Los Angeles Times*, resident assistants knocked on doors in the blacked-out Chapultepec Hall dormitory in particular to order students to "leave the building and go home or stay with friends." The paper further alleged that resident assistants told students who remained in the dorm that they would have to surrender their campus ID cards so that administrators could keep tabs on those staying. SDSU has denied these allegations through

<sup>7</sup>  
<http://www.oes.ca.gov/Operational/OESHome.nsf/978596171691962788256b350061870e/55C950F3BE85D1C688256CD8007CD9CB>

a letter from Sally Roush, Vice President for Business and Financial Affairs, to the respective committees.

### VI. Conclusion

Throughout the past two decades, the Legislature has focused California's attention on the imperative of preserving the state's supply of electricity and the necessity of maintaining the grid to support higher usage at various times. While it is generally understood that outages will occur and that accidents will happen, it is crucial that governments, agencies, and private companies work to both minimize these incidents maintain a sense of calm and continuity for the public when emergencies occur. Maintaining reliability of communication infrastructure during natural or manmade events is also an imperative. It is important to note that during the Pacific Southwest Outage, disaster was avoided. The utilities, jurisdictions affected, and residents of Southern California very much deserve to be commended in this regard.

Nonetheless, there are still lessons that can be learned from the southland's recovery from this incident. It is clear that, while praise is merited, room for improvement exists within both the public and private sectors. It is imperative that we, as a state, continue to strive for improvement in this arena with a keen eye towards enhanced public safety and emergency management when outages occur.

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**2013  
LOCAL CAPACITY TECHNICAL  
ANALYSIS**

**FINAL REPORT  
AND STUDY RESULTS**

April 30, 2012

**Local Capacity Technical Study  
Overview and Results**

**I. Executive Summary**

This Report documents the results and recommendations of the 2013 Local Capacity Technical (LCT) Study. The LCT Study assumptions, processes, and criteria were discussed and recommended through the 2013 Local Capacity Technical Study Criteria, Methodology and Assumptions Stakeholder Meeting held on November 10, 2011. On balance, the assumptions, processes, and criteria used for the 2013 LCT Study mirror those used in the 2007-2012 LCT Studies, which were previously discussed and recommended through the LCT Study Advisory Group ("LSAG")<sup>1</sup>, an advisory group formed by the CAISO to assist the CAISO in its preparation for performing prior LCT Studies.

The 2013 LCT study results are provided to the CPUC for consideration in its 2013 resource adequacy requirements program. These results will also be used by the CAISO as "Local Capacity Requirements" or "LCR" (minimum quantity of local capacity necessary to meet the LCR criteria) and for assisting in the allocation of costs of any CAISO procurement of capacity needed to achieve the Reliability Standards notwithstanding the resource adequacy procurement of Load Serving Entities (LSEs).<sup>2</sup>

Please note that these studies assume that SONGS will be fully operational in 2013. At the time this study was completed, SONGS was on an extended forced outage and the expected date that it would return to service was unknown. The ISO will continue to monitor the status of SONGS and reassess the 2013 LCR values, as needed.

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<sup>1</sup> The LSAG consists of a representative cross-section of stakeholders, technically qualified to assess the issues related to the study assumptions, process and criteria of the existing LCT Study methodology and to recommend changes, where needed.

<sup>2</sup> For information regarding the conditions under which the CAISO may engage in procurement of local capacity and the allocation of the costs of such procurement, please see Sections 41 and 43 of the current CAISO Tariff, at: <http://www.caiso.com/238a/238acd24167f0.html>.

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Below is a comparison of the 2013 vs. 2012 total LCR:

**2013 Local Capacity Requirements**

Local Area Name	Qualifying Capacity			2013 LCR Need Based on Category B			2013 LCR Need Based on Category C with operating procedure		
	QF/ Muni (MW)	Market (MW)	Total (MW)	Existing Capacity Needed	Deficien cy	Total (MW)	Existing Capacity Needed**	Deficien cy	Total (MW)
Humboldt	55	162	217	143	0	143	190	22*	212
North Coast / North Bay	130	739	869	629	0	629	629	0	629
Sierra	1274	765	2039	1408	0	1408	1712	218*	1930
Stockton	216	404	620	242	0	242	413	154*	567
Greater Bay	1368	6296	7664	3479	0	3479	4502	0	4502
Greater Fresno	314	2503	2817	1786	0	1786	1786	0	1786
Kern	684	0	684	295	0	295	483	42*	525
LA Basin	4452	8675	13127	10295	0	10295	10295	0	10295
Big Creek/ Ventura	1179	4097	5276	2161	0	2161	2241	0	2241
San Diego/ Imperial Valley	158	3991	4149	2938	0	2938	2938	144*	3082
<b>Total</b>	<b>9830</b>	<b>27632</b>	<b>37462</b>	<b>23376</b>	<b>0</b>	<b>23376</b>	<b>25189</b>	<b>580</b>	<b>25769</b>

**2012 Local Capacity Requirements**

Local Area Name	Qualifying Capacity			2012 LCR Need Based on Category B			2012 LCR Need Based on Category C with operating procedure		
	QF/ Muni (MW)	Market (MW)	Total (MW)	Existing Capacity Needed	Deficien cy	Total (MW)	Existing Capacity Needed**	Deficien cy	Total (MW)
Humboldt	54	168	222	159	0	159	190	22*	212
North Coast / North Bay	131	728	859	613	0	613	613	0	613
Sierra	1277	760	2037	1489	36*	1525	1685	289*	1974
Stockton	246	259	505	145	0	145	389	178*	567
Greater Bay	1312	5276	6588	3647	0	3647	4278	0	4278
Greater Fresno	356	2414	2770	1873	0	1873	1899	8*	1907
Kern	602	9	611	180	0	180	297	28*	325
LA Basin	4029	8054	12083	10865	0	10865	10865	0	10865
Big Creek/ Ventura	1191	4041	5232	3093	0	3093	3093	0	3093
San Diego	162	2925	3087	2849	0	2849	2849	95*	2944
<b>Total</b>	<b>9360</b>	<b>24634</b>	<b>33994</b>	<b>24913</b>	<b>36</b>	<b>24949</b>	<b>26158</b>	<b>620</b>	<b>26778</b>

\* No local area is "overall deficient". Resource deficiency values result from a few deficient sub-areas; and since there are no resources that can mitigate this deficiency the numbers are carried forward into the total area needs. Resource deficient sub-area implies that in order to comply with the criteria, at summer peak, load may be shed immediately after the first contingency.  
\*\* Since "deficiency" cannot be mitigated by any available resource, the "Existing Capacity Needed" will be split among LSEs on a load share ratio during the assignment of local area resource responsibility.

Overall, the LCR needs have decreased by more than 1000 MW or about 4% from 2012 to 2013. The LCR needs have decreased in the following areas: Sierra, Fresno and LA Basin due to downward trend for load; Big Creek/Ventura due to downward trend for load, new transmission projects as well as load allocation change among substations. The LCR needs are steady in Humboldt and Stockton. The LCR needs have slightly increased in North Coast/North Bay, Bay Area and Kern due to load growth; San Diego due to load growth as well as deficiency increase in two small sub-areas however the total resource capacity needed for San Diego decreased slightly mainly due to changes to the WECC Regional Criteria<sup>3</sup> related to the definition of adjacent circuits resulting in the performance requirements for the simultaneous loss of the Sunrise Power Link and South West Power Link being classified as Category D as to compared to a category C event as well as elimination of WECC 1000 MW path rating on Sunrise Power Link. However, over the longer-term, there are expected LCR deficiencies in San Diego area due to the 2017 OTC compliance date for the Encina power plant and to the most restrictive contingency for this area limiting the pool of resources (qualifying capacity) effective in addressing the local area needs. Furthermore the San Diego local area has been expanded to include the Imperial Valley substation because the newly formed local area has higher requirements than the existing San Diego local area alone. The write-up for each Local Capacity Area lists important new projects included in the base cases as well as a description of reason for changes between 2013 and 2012 LCRs.

The ISO has undertaken an LCR assessment of the Valley Electric service area. There are no LCR needs in this new local area due to unavailability of local resources; however there are two constraints that may require local area resources in the future. Detailed results can be found in the Valley Electric section at the end of this report.

<sup>3</sup> TPL-001-WECC-CRT-2 System Performance Criterion – Effective April 1 2012

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The ISO has undertaken a non-summer season LCR assessment of the San Diego area at stakeholder request. These results are for information purposes only and they will not be used to alter the 2013 LSE local resource allocation. The LSE local resource allocation is done based on the summer peak study as required by the ISO Tariff. Detailed results can be found at the end of the San Diego - Imperial Valley area section in this report.

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II. Study Overview: Inputs, Outputs and Options

A. Objectives

As was the objective of the five previous annual LCT Studies, the intent of the 2013 LCT Study is to identify specific areas within the CAISO Balancing Authority Area that have limited import capability and determine the minimum generation capacity (MW) necessary to mitigate the local reliability problems in those areas.

B. Key Study Assumptions

1. Inputs and Methodology

The CAISO incorporated into its 2013 LCT study the same criteria, input assumptions and methodology that were incorporated into its previous years LCR studies. These inputs, assumptions and methodology were discussed and agreed to by stakeholders at the 2013 LCT Study Criteria, Methodology and Assumptions Stakeholder Meeting held on November 10, 2011.

The following table sets forth a summary of the approved inputs and methodology that have been used in the previous LCT studies as well as this 2013 LCT Study:

Summary Table of Inputs and Methodology Used in this LCT Study:

Issue:	How are they incorporated into this LCT study:
<u>Input Assumptions:</u>	
• Transmission System Configuration	The existing transmission system has been modeled, including all projects operational on or before June 1, of the study year and all other feasible operational solutions brought forth by the PTOs and as agreed to by the CAISO.
• Generation Modeled	The existing generation resources has been modeled and also includes all projects that will be on-line and commercial on or before June 1, of the study year
• Load Forecast	Uses a 1-in-10 year summer peak load forecast
<u>Methodology:</u>	
• Maximize Import Capability	Import capability into the load pocket has been maximized, thus minimizing the generation required in the load pocket to meet applicable reliability requirements.
• QF/Nuclear/State/Federal Units	Regulatory Must-take and similarly situated units like QF/Nuclear/State/Federal resources have been modeled on-line at qualifying capacity output values for purposes of this LCT Study.
• Maintaining Path Flows	Path flows have been maintained below all established path ratings into the load pockets, including the 500 kV. For clarification, given the existing transmission system configuration, the only 500 kV path that flows directly into a load pocket and will, therefore, be considered in this LCR Study is the South of Lugo transfer path flowing into the LA Basin.
<u>Performance Criteria:</u>	
• Performance Level B & C, including incorporation of PTO operational solutions	This LCT Study is being published based on Performance Level B and Performance Level C criterion, yielding the low and high range LCR scenarios. In addition, the CAISO will incorporate all new projects and other feasible and CAISO-approved operational solutions brought forth by the PTOs that can be operational on or before June 1, of the study year. Any such solutions that can reduce the need for procurement to meet the Performance Level C criteria will be incorporated into the LCT Study.
<u>Load Pocket:</u>	
• Fixed Boundary, including limited reference to published effectiveness factors	This LCT Study has been produced based on load pockets defined by a fixed boundary. The CAISO only publishes effectiveness factors where they are useful in facilitating procurement where excess capacity exists within a load pocket.

Further details regarding the 2013 LCT Study methodology and assumptions are provided in Section III, below.

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**C. Grid Reliability**

Service reliability builds from grid reliability because grid reliability is reflected in the Reliability Standards of the North American Electric Reliability Council (NERC) and the Western Electricity Coordinating Council ("WECC") Regional Criteria (collectively "Reliability Standards"). The Reliability Standards apply to the interconnected electric system in the United States and are intended to address the reality that within an integrated network, whatever one Balancing Authority Area does can affect the reliability of other Balancing Authority Areas. Consistent with the mandatory nature of the Reliability Standards, the CAISO is under a statutory obligation to ensure efficient use and reliable operation of the transmission grid consistent with achievement of the Reliability Standards.<sup>4</sup> The CAISO is further under an obligation, pursuant to its FERC-approved Transmission Control Agreement, to secure compliance with all "Applicable Reliability Criteria." Applicable Reliability Criteria consists of the Reliability Standards as well as reliability criteria adopted by the CAISO (Grid Planning Standards).

The Reliability Standards define reliability on interconnected electric systems using the terms "adequacy" and "security." "Adequacy" is the ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times, taking into account physical characteristics of the transmission system such as transmission ratings and scheduled and reasonably expected unscheduled outages of system elements. "Security" is the ability of the electric systems to withstand sudden disturbances such as electric short circuits or unanticipated loss of system elements. The Reliability Standards are organized by Performance Categories. Certain categories require that the grid operator not only ensure that grid integrity is maintained under certain adverse system conditions (e.g., security), but also that all customers continue to receive electric supply to meet demand (e.g., adequacy). In that case, grid reliability and service reliability would overlap. But there are other levels of performance where security can be maintained without ensuring adequacy.

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<sup>4</sup> Pub. Utilities Code § 345

**D. Application of N-1, N-1-1, and N-2 Criteria**

The CAISO will maintain the system in a safe operating mode at all times. This obligation translates into respecting the Reliability Criteria at all times, for example during normal operating conditions Category A (N-0) the CAISO must protect for all single contingencies Category B (N-1) and common mode Category C5 (N-2) double line outages. Also, after a single contingency, the CAISO must re-adjust the system to support the loss of the next most stringent contingency. This is referred to as the N-1-1 condition.

The N-1-1 vs N-2 terminology was introduced only as a mere temporal differentiation between two existing NERC Category C events. N-1-1 represents NERC Category C3 ("category B contingency, manual system adjustment, followed by another category B contingency"). The N-2 represents NERC Category C5 ("any two circuits of a multiple circuit tower line") as well as requirement R1.1 of the WECC Regional Criteria<sup>3</sup> ("two adjacent circuits") with no manual system adjustment between the two contingencies.

**E. Performance Criteria**

As set forth on the Summary Table of Inputs and Methodology, this LCT Report is based on NERC performance level B and performance level C standard. The NERC Standards refer mainly to system being stable and both thermal and voltage limits be within applicable ratings. However, the CAISO also tests the electric system in regards to the dynamic and reactive margin compliance with the existing WECC regional criteria that further specifies the dynamic and reactive margin requirements for the same NERC performance levels. These performance levels can be described as follows:

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a. LCR Performance Criteria- Category B

Category B describes the system performance that is expected immediately following the loss of a single transmission element, such as a transmission circuit, a generator, or a transformer.

Category B system performance requires that system is stable and all thermal and voltage limits must be within their "Applicable Rating," which, in this case, are the emergency ratings as generally determined by the PTO or facility owner. Applicable Rating includes a temporal element such that emergency ratings can only be maintained for certain duration. Under this category, load cannot be shed in order to assure the Applicable Ratings are met; however there is no guarantee that facilities are returned to within normal ratings or to a state where it is safe to continue to operate the system in a reliable manner such that the next element out will not cause a violation of the Applicable Ratings.

b. LCR Performance Criteria- Category C

The Reliability Standards require system operators to "look forward" to make sure they safely prepare for the "next" N-1 following the loss of the "first" N-1 (stay within Applicable Ratings after the "next" N-1). This is commonly referred to as N-1-1. Because it is assumed that some time exists between the "first" and "next" element losses, operating personnel may make any reasonable and feasible adjustments to the system to prepare for the loss of the second element, including, operating procedures, dispatching generation, moving load from one substation to another to reduce equipment loading, dispatching operating personnel to specific station locations to manually adjust load from the substation site, or installing a "Special Protection Scheme" that would remove pre-identified load from service upon the loss of the "next" element.<sup>5</sup> All Category C requirements in this report refer to situations when in real time

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<sup>5</sup> A Special Protection Scheme is typically proposed as an operational solution that does not require

(N-0) or after the first contingency (N-1) the system requires additional readjustment in order to prepare for the next worst contingency. In this time frame, load drop is not allowed per existing Reliability Standards.

Generally, Category C describes system performance that is expected following the loss of two or more system elements. This loss of two elements is generally expected to happen simultaneously, referred to as N-2. It should be noted that once the "next" element is lost after the first contingency, as discussed above under the Performance Criteria B, N-1-1 scenario, the event is effectively a Category C. As noted above, depending on system design and expected system impacts, the **planned and controlled** interruption of supply to customers (load shedding), the removal from service of certain generators and curtailment of exports may be utilized to maintain grid "security."

c. CAISO Statutory Obligation Regarding Safe Operation

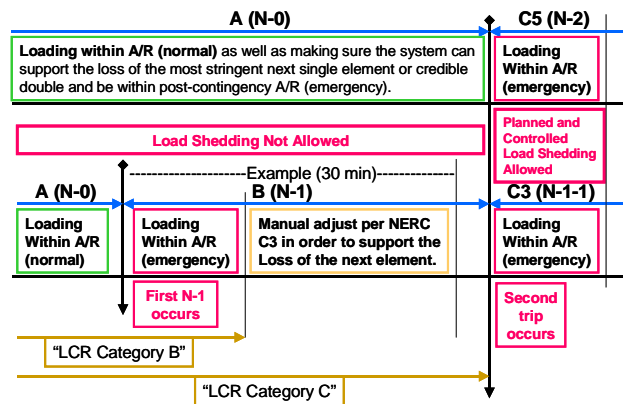
The CAISO will maintain the system in a safe operating mode at all times. This obligation translates into respecting the Reliability Standards at all times, for example during normal operating conditions Category **A (N-0)** the CAISO must protect for all single contingencies Category **B (N-1)** and common mode Category **C5 (N-2)** double line outages. As a further example, after a single contingency the CAISO must readjust the system in order to be able to support the loss of the next most stringent contingency Category **C3 (N-1-1)**.

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additional generation and permits operators to effectively prepare for the next event as well as ensure security should the next event occur. However, these systems have their own risks, which limit the extent to which they could be deployed as a solution for grid reliability augmentation. While they provide the value of protecting against the next event without the need for pre-contingency load shedding, they add points of potential failure to the transmission network. This increases the potential for load interruptions because sometimes these systems will operate when not required and other times they will not operate when needed.

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Figure 1: Temporal graph of LCR Category B vs. LCR Category C:



The following definitions guide the CAISO's interpretation of the Reliability Standards governing safe mode operation and are used in this LCT Study:

**Applicable Rating:**

This represents the equipment rating that will be used under certain contingency conditions.

Normal rating is to be used under normal conditions.

Long-term emergency ratings, if available, will be used in all emergency conditions as long as "system readjustment" is provided in the amount of time given (specific to each element) to reduce the flow to within the normal ratings. If not available normal rating is to be used.

Short-term emergency ratings, if available, can be used as long as "system

readjustment" is provided in the "short-time" available in order to reduce the flow to within the long-term emergency ratings where the element can be kept for another length of time (specific to each element) before the flow needs to be reduced the below the normal ratings. If not available long-term emergency rating should be used.

Temperature-adjusted ratings shall not be used because this is a year-ahead study not a real-time tool, as such the worst-case scenario must be covered. In case temperature-adjusted ratings are the only ratings available then the minimum rating (highest temperature) given the study conditions shall be used.

CAISO Transmission Register is the only official keeper of all existing ratings mentioned above.

Ratings for future projects provided by PTO and agree upon by the CAISO shall be used.

Other short-term ratings not included in the CAISO Transmission Register may be used as long as they are engineered, studied and enforced through clear operating procedures that can be followed by real-time operators.

Path Ratings need to be maintained within their limits in order to assure that proper capacity is available in order to operate the system in real-time in a safe operating zone.

**Controlled load drop:**

This is achieved with the use of a Special Protection Scheme.

**Planned load drop:**

This is achieved when the most limiting equipment has short-term emergency ratings AND the operators have an operating procedure that clearly describes the actions that need to be taken in order to shed load.

**Special Protection Scheme:**

All known SPS shall be assumed. New SPS must be verified and approved by the CAISO and must comply with the new SPS guideline described in the CAISO Planning Standards.

**System Readjustment:**

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This represents the actions taken by operators in order to bring the system within a safe operating zone after any given contingency in the system.

Actions that can be taken as system readjustment after a single contingency (Category B):

1. System configuration change – based on validated and approved operating procedures
2. Generation re-dispatch
  - a. Decrease generation (up to 1150 MW) – limit given by single contingency SPS as part of the CAISO Grid Planning standards (ISO G4)
  - b. Increase generation – this generation will become part of the LCR need

Actions, which shall not be taken as system readjustment after a single contingency (Category B):

1. Load drop – based on the intent of the CAISO/WECC and NERC standards for category B contingencies.

This is one of the most controversial aspects of the interpretation of NERC Transmission Planning Standards since footnote b) mentions that load shedding can be done after a category B event in certain local areas in order to maintain compliance with performance criteria. However, the main body of the criteria spells out that no dropping of load should be done following a single contingency. All stakeholders and the CAISO agree that no involuntary interruption of load should be done immediately after a single contingency. Further, the CAISO and stakeholders now agree on the viability of dropping load as part of the system readjustment period – in order to protect for the next most limiting contingency. After a single contingency, it is understood that the system is in a Category B condition and the system should be planned based on the body of the criteria with no shedding of load regardless of whether it is done immediately or in 15-30 minute after the original contingency. Category C conditions only arrive after the second contingency has happened; at that point in time, shedding load is allowed in a planned and controlled manner.

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A robust California transmission system should be, and under the LCT Study is being, planned based on the main body of the TPL Standards, and should not be planned based on footnote b) regarding Category B contingencies. Therefore, if there are available resources in the area, they are looked to meet reliability needs (and included in the LCR requirement) before resorting to involuntary load curtailment. The footnote may be applied for criteria compliance issues only where there are no resources available in the area.

Time allowed for manual readjustment:

This is the amount of time required for the operator to take all actions necessary to prepare the system for the next contingency. This time should be less than 30 minutes, based on existing CAISO Planning Standards.

This is a somewhat controversial aspect of the interpretation of existing criteria. This item is very specific in the CAISO Planning Standards. However, some will argue that 30 minutes only allows generation re-dispatch and automated switching where remote control is possible. If remote capability does not exist, a person must be dispatched in the field to do switching and 30 minutes may not allow sufficient time. If approved, an exemption from the existing time requirements may be given for small local areas with very limited exposure and impact, clearly described in operating procedures, and only until remote controlled switching equipment can be installed.

### F. The Two Options Presented In This LCT Report

This LCT Study sets forth different solution "options" with varying ranges of potential service reliability consistent with CAISO's Planning Standard. The CAISO applies Option 2 for its purposes of identifying necessary local capacity needs and the corresponding potential scope of its backstop authority. Nevertheless, the CAISO continues to provide Option 1 as a point of reference for the CPUC and Local Regulatory Authorities in considering procurement targets for their jurisdictional LSEs.

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1. Option 1- Meet LCR Performance Criteria Category B

Option 1 is a service reliability level that reflects generation capacity that must be available to comply with reliability standards immediately after a NERC Category B given that load cannot be removed to meet this performance standard under Reliability Criteria. However, this capacity amount implicitly relies on load interruption as the **only means** of meeting any Reliability Standard that is beyond the loss of a single transmission element (N-1). These situations will likely require substantial load interruptions in order to maintain system continuity and alleviate equipment overloads prior to the actual occurrence of the second contingency.<sup>6</sup>

2. Option 2- Meet LCR Performance Criteria Category C and Incorporate Suitable Operational Solutions

Option 2 is a service reliability level that reflects generation capacity that is needed to readjust the system to prepare for the loss of a second transmission element (N-1-1) using generation capacity *after* considering all reasonable and feasible operating solutions (including those involving customer load interruption) developed and approved by the CAISO, in consultation with the PTOs. Under this option, there is no expected load interruption to end-use customers under normal or single contingency conditions as the CAISO operators prepare for the second contingency. However, the customer load may be interrupted in the event the second contingency occurs.

As noted, Option 2 is the local capacity level that the CAISO requires to reliably operate the grid per NERC, WECC and CAISO standards. As such, the CAISO recommends adoption of this Option to guide resource adequacy procurement.

III. Assumption Details: How the Study was Conducted

A. System Planning Criteria

<sup>6</sup> This potential for pre-contingency load shedding also occurs because real time operators must prepare for the loss of a common mode N-2 at all times.

The following table provides a comparison of system planning criteria, based on the performance requirements of the NERC Reliability Standard, used in the study:

Table 4: Criteria Comparison

Contingency Component(s)	ISO Grid Planning Standard	Old RMR Criteria	Local Capacity Criteria
<b>A – No Contingencies</b>	X	X	X
<b>B – Loss of a single element</b>			
1. Generator (G-1)	X	X	X1
2. Transmission Circuit (L-1)	X	X	X1
3. Transformer (T-1)	X	X2	X1,2
4. Single Pole (dc) Line	X	X	X1
5. G-1 system readjusted L-1	X	X	X
<b>C – Loss of two or more elements</b>			
1. Bus Section	X		
2. Breaker (failure or internal fault)	X		
3. L-1 system readjusted G-1	X		X
3. G-1 system readjusted T-1 or T-1 system readjusted G-1	X		X
3. L-1 system readjusted T-1 or T-1 system readjusted L-1	X		X
3. G-1 system readjusted G-1	X		X
3. L-1 system readjusted L-1	X		X
3. T-1 system readjusted T-1	X		
4. Bipolar (dc) Line	X		X
5. Two circuits (Common Mode or Adjacent Circuit) L-2	X		X
6. SLG fault (stuck breaker or protection failure) for G-1	X		
7. SLG fault (stuck breaker or protection failure) for L-1	X		
8. SLG fault (stuck breaker or protection failure) for T-1	X		
9. SLG fault (stuck breaker or protection failure) for Bus section WECC-R1.2. Two generators (Common Mode) G-2	X3		X
<b>D – Extreme event – loss of two or more elements</b>			
Any B1-4 system readjusted (Common Mode or Adjacent Circuit) L-2	X4		X3
All other extreme combinations D1-14.	X4		
1 System must be able to readjust to a safe operating zone in order to be able to support the loss of the next contingency. 2 A thermal or voltage criterion violation resulting from a transformer outage may not be cause for a local area reliability requirement if the violation is considered marginal (e.g. acceptable loss of facility life or low voltage), otherwise, such a violation will necessitate creation of a requirement. 3 Evaluate for risks and consequence, per NERC standards. No voltage collapse or dynamic instability allowed. 4 Evaluate for risks and consequence, per NERC standards.			

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A significant number of simulations were run to determine the most critical contingencies within each Local Capacity Area. Using power flow, post-transient load flow, and stability assessment tools, the system performance results of all the contingencies that were studied were measured against the system performance requirements defined by the criteria shown in Table 4. Where the specific system performance requirements were not met, generation was adjusted such that the minimum amount of generation required to meet the criteria was determined in the Local Capacity Area. The following describes how the criteria were tested for the specific type of analysis performed.

**1. Power Flow Assessment:**

<u>Contingencies</u>	<u>Thermal Criteria</u> <sup>3</sup>	<u>Voltage Criteria</u> <sup>4</sup>
Generating unit <sup>1, 6</sup>	Applicable Rating	Applicable Rating
Transmission line <sup>1, 6</sup>	Applicable Rating	Applicable Rating
Transformer <sup>1, 6</sup>	Applicable Rating <sup>5</sup>	Applicable Rating <sup>5</sup>
(G-1)/(L-1) <sup>2, 6</sup>	Applicable Rating	Applicable Rating
Overlapping <sup>6, 7</sup>	Applicable Rating	Applicable Rating

- <sup>1</sup> All single contingency outages (i.e. generating unit, transmission line or transformer) will be simulated on Participating Transmission Owners' local area systems.
- <sup>2</sup> Key generating unit out, system readjusted, followed by a line outage. This overlapping outage is considered a single contingency within the ISO Grid Planning Criteria. Therefore, load dropping for an overlapping G-1, L-1 scenario is not permitted.
- <sup>3</sup> Applicable Rating – Based on ISO Transmission Register or facility upgrade plans including established Path ratings.
- <sup>4</sup> Applicable Rating – ISO Grid Planning Criteria or facility owner criteria as appropriate including established Path ratings.
- <sup>5</sup> A thermal or voltage criterion violation resulting from a transformer outage may not be cause for a local area reliability requirement if the violation is considered marginal (e.g. acceptable loss of facility life or low voltage), otherwise, such a violation will necessitate creation of a requirement.
- <sup>6</sup> Following the first contingency (N-1), the generation must be sufficient to allow the operators to bring the system back to within acceptable (normal) operating range (voltage and loading) and/or appropriate OTC following the studied outage conditions.
- <sup>7</sup> During normal operation or following the first contingency (N-1), the generation must be sufficient to allow the operators to prepare for the next worst N-1 or common mode N-2 without pre-contingency interruptible or firm load shedding. SPS/RAS/Safety Nets may be utilized to satisfy the criteria after the second N-1

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or common mode N-2 except if the problem is of a thermal nature such that short-term ratings could be utilized to provide the operators time to shed either interruptible or firm load. T-2s (two transformer bank outages) would be excluded from the criteria.

**2. Post Transient Load Flow Assessment:**

<u>Contingencies</u> <u>Selected</u> <sup>1</sup>	<u>Reactive Margin Criteria</u> <sup>2</sup> <u>Applicable Rating</u>
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- <sup>1</sup> If power flow results indicate significant low voltages for a given power flow contingency, simulate that outage using the post transient load flow program. The post-transient assessment will develop appropriate Q/V and/or P/V curves.
- <sup>2</sup> Applicable Rating – positive margin based on the higher of imports or load increase by 5% for N-1 contingencies, and 2.5% for N-2 contingencies.

**3. Stability Assessment:**

<u>Contingencies</u> <u>Selected</u> <sup>1</sup>	<u>Stability Criteria</u> <sup>2</sup> <u>Applicable Rating</u>
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- <sup>1</sup> Base on historical information, engineering judgment and/or if power flow or post transient study results indicate significant low voltages or marginal reactive margin for a given contingency.
- <sup>2</sup> Applicable Rating – ISO Grid Planning Criteria or facility owner criteria as appropriate.

**B. Load Forecast**

**1. System Forecast**

The California Energy Commission (CEC) derives the load forecast at the system and Participating Transmission Owner (PTO) levels. This relevant CEC forecast is then distributed across the entire system, down to the local area, division and substation level. The PTOs use an econometric equation to forecast the system load. The predominant parameters affecting the system load are (1) number of households, (2) economic activity (gross metropolitan products, GMP), (3) temperature and (4) increased energy efficiency and distributed generation programs.

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### 2. Base Case Load Development Method

The method used to develop the base case loads is a melding process that extracts, adjusts and modifies the information from the system, distribution and municipal utility forecasts. The melding process consists of two parts: Part 1 deals with the PTO load and Part 2 deals with the municipal utility load. There may be small differences between the methodologies used by each PTO to disaggregate the CEC load forecast to their level of local area as well as bar-bus model.

#### a. PTO Loads in Base Case

The methods used to determine the PTO loads are, for the most part, similar. One part of the method deals with the determination of the division<sup>7</sup> loads that would meet the requirements of 1-in-5 or 1-in-10 system or area base cases and the other part deals with the allocation of the division load to the transmission buses.

##### i. Determination of division loads

The annual division load is determined by summing the previous year division load and the current division load growth. Thus, the key steps are the determination of the initial year division load and the annual load growth. The initial year for the base case development method is based heavily on recorded data. The division load growth in the system base case is determined in two steps. First, the total PTO load growth for the year is determined, as the product of the PTO load and the load growth rate from the system load forecast. Then this total PTO load growth is allocated to the division, based on the relative magnitude of the load growth projected for the divisions by the distribution planners. For example, for the 1-in-10 area base case, the division load growth determined for the system base case is adjusted to the 1-in-10 temperature using the load temperature relation determined from the latest peak load and temperature data of the division.

<sup>7</sup> Each PTO divides its territory in a number of smaller area named divisions. These are usually smaller and compact areas that have the same temperature profile.

##### ii. Allocation of division load to transmission bus level

Since the base case loads are modeled at the various transmission buses, the division loads developed must be allocated to those buses. The allocation process is different depending on the load types. For the most part, each PTO classifies its loads into four types: conforming, non-conforming, self-generation and generation-plant loads. Since the non-conforming and self-generation loads are assumed to not vary with temperature, their magnitude would be the same in the system or area base cases of the same year. The remaining load (the total division load developed above, less the quantity of non-conforming and self-generation load) is the conforming load. The remaining load is allocated to the transmission buses based on the relative magnitude of the distribution forecast. The summation of all base case loads is generally higher than the load forecast because some load, i.e., self-generation and generation-plant, are behind the meter and must be modeled in the base cases. However, for the most part, metered or aggregated data with telemetry is used to come up with the load forecast.

#### b. Municipal Loads in Base Case

The municipal utility forecasts that have been provided to the CEC and PTOs for the purposes of their base cases were also used for this study.

### C. Power Flow Program Used in the LCT analysis

The technical studies were conducted using General Electric's Power System Load Flow (GE PSLF) program version 17.0. This GE PSLF program is available directly from GE or through the Western System Electricity Council (WECC) to any member.

To evaluate Local Capacity Areas, the starting base case was adjusted to reflect the latest generation and transmission projects as well as the one-in-ten-year peak load forecast for each Local Capacity Area as provided to the CAISO by the PTOs.

Electronic contingency files provided by the PTOs were utilized to perform the numerous contingencies required to identify the LCR. These contingency files include remedial action and special protection schemes that are expected to be in operation

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during the year of study. An CAISO created EPCL (a GE programming language contained within the GE PSFL package) routine was used to run the combination of contingencies; however, other routines are available from WECC with the GE PSFL package or can be developed by third parties to identify the most limiting combination of contingencies requiring the highest amount of generation within the local area to maintain power flows within applicable ratings.

#### IV. Local Capacity Requirement Study Results

##### A. Summary of Study Results

LCR is defined as the amount of generating capacity that is needed within a Local Capacity Area to reliably serve the load located within this area. The results of the CAISO's analysis are summarized in the Executive Summary Tables.

**Table 5: 2013 Local Capacity Needs vs. Peak Load and Local Area Generation**

	2013 Total LCR (MW)	Peak Load (1 in 10) (MW)	2013 LCR as % of Peak Load	Total Dependable Local Area Generation (MW)	2013 LCR as % of Total Area Generation
Humboldt	212	210	101%	217	98%**
North Coast/North Bay	629	1479	43%	869	72%
Sierra	1930	1738	111%	2039	95%**
Stockton	567	1109	51%	620	91%**
Greater Bay	4502	10233	44%	7664	59%
Greater Fresno	1786	3032	59%	2817	63%
Kern	525	1311	40%	584	90%**
LA Basin	10295	19460	53%	13127	78%
Big Creek/Ventura	2241	4596	49%	5276	42%
San Diego	3082	5114	60%	4149	74%**
<b>Total</b>	<b>25,769</b>	<b>48282*</b>	<b>53%*</b>	<b>37,362</b>	<b>69%</b>

**Table 6: 2012 Local Capacity Needs vs. Peak Load and Local Area Generation**

	2012 Total LCR (MW)	Peak Load (1 in 10) (MW)	2012 LCR as % of Peak Load	Total Dependable Local Area Generation (MW)	2012 LCR as % of Total Area Generation
Humboldt	212	210	101%	222	95%**
North Coast/North Bay	613	1420	43%	859	71%
Sierra	1974	1816	109%	2037	97%**
Stockton	567	1086	52%	505	112%**
Greater Bay	4278	9954	43%	6588	65%
Greater Fresno	1907	3120	61%	2770	69%**
Kern	325	1110	29%	611	53%**
LA Basin	10865	19931	55%	12083	90%
Big Creek/Ventura	3093	4693	66%	5232	59%
San Diego	2944	4844	61%	3087	95%**
<b>Total</b>	<b>26,778</b>	<b>48184*</b>	<b>56%*</b>	<b>33,994</b>	<b>79%</b>

\* Value shown only illustrative, since each local area peaks at a time different from the system coincident peak load.

\*\* Generation deficient LCA (or with sub-area that is deficient) – deficiency included in LCR. Generator deficient area implies that in order to comply with the criteria, at summer peak, load may be shed immediately after the first contingency.

Tables 5 and 6 shows how much of the Local Capacity Area load is dependent on local generation and how much local generation must be available in order to serve the load in those Local Capacity Areas in a manner consistent with the Reliability Criteria. These tables also indicate where new transmission projects, new generation additions or demand side management programs would be most useful in order to reduce the dependency on existing, generally older and less efficient local area generation.

The term "Qualifying Capacity" used in this report is the latest "Net Qualifying Capacity" ("NQC") posted on the CAISO web site at:

<http://www.caiso.com/1796/179688b22c970.html>

The NQC list includes the area (if applicable) where each resource is located for units already operational. Neither the NQC list nor this report incorporates Demand Side Management programs and their related NQC. Units scheduled to become operational before 6/1/2013 have been included in this 2013 LCR Report and added to

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the total NQC values for those respective areas (see detail write-up for each area).

The first column, "Qualifying Capacity," reflects two sets of generation. The first set is comprised of generation that would normally be expected to be on-line such as Municipal generation and Regulatory Must-take generation (state, federal, QFs, wind and nuclear units). The second set is "market" generation. The second column, "2013 LCR Requirement Based on Category B" identifies the local capacity requirements, and deficiencies that must be addressed, in order to achieve a service reliability level based on Performance Criteria- Category B. The third column, "2013 LCR Requirement Based on Category C with Operating Procedure", sets forth the local capacity requirements, and deficiencies that must be addressed, necessary to attain a service reliability level based on Performance Criteria-Category C with operational solutions.

**B. Summary of Zonal Needs**

Based on the existing import allocation methodology, the only major 500 kV constraint not accounted for is path 26 (Midway-Vincent). ***The current method allocates capacity on path 26 similar to the way imports are allocated to LSEs.*** The total resources needed (based on the latest CEC load forecast) in each the two relevant zones, SP26 and NP26 is:

Zone	Load Forecast (MW)	15% reserves (MW)	(-) Allocated imports (MW)	(-) Allocated Path 26 Flow (MW)	Total Zonal Resource Need (MW)
SP26	28253	4238	-7836	-3750	20905
NP26=NP15+ZP26	21883	3282	-4600	-2902	17663

Where:

Load Forecast is the most recent 1 in 2 CEC forecast for year 2013.

Reserve Margin is the minimum CPUC approved planning reserve margin of 15%.

Allocated Imports are the actual 2012 Available Import Capability for loads in the CAISO control area numbers that are not expected to change much by 2013 because there are no additional import transmission additions to the grid between now and summer of 2013.

Allocated Path 26 flow The CAISO determines the amount of Path 26 transfer capacity available for RA counting purposes after accounting for (1) Existing Transmission Contracts (ETCs) that serve load outside the CAISO Balancing Area<sup>8</sup> and (2) loop flow<sup>9</sup> from the maximum path 26 rating of 4000 MW (North-to-South) and 3000 MW (South-to-North).

Both NP 26 and SP 26 load forecast, import allocation and zonal results refer to the CAISO Balancing Area only. This is done in order to be consistent with the import allocation methodology.

All resources that are counted as part of the Local Area Capacity Requirements fully count toward the Zonal Need. The local areas of San Diego, LA Basin and Big Creek/Ventura are all situated in SP26 and the remaining local areas are in NP26.

**Changes compared to last year's results:**

- The load forecast went up in Southern California by about 800 MW and up in Northern California by about 700 MW.
- The Import Allocations went down in Southern California by about 1000 MW and down in Northern California by about 100 MW.
- The Path 26 transfer capability has not changed and is not envisioned to change in the near future. As such, the LSEs should assume that their load/share ratio allocation for path 26 will stay at the same levels as 2012. If there are any changes, they will be heavily influenced by the pre-existing "grandfathered contracts" and when they expire most of the LSEs will likely see their load share ratio going up, while the owners of these grandfathered contracts may see their share decreased to the load-share ratio.

<sup>8</sup> The transfer capability on Path 26 must be derated to accommodate ETCs on Path 26 that are used to serve load outside of the CAISO Balancing Area. These particular ETCs represent physical transmission capacity that cannot be allocated to LSEs within the CAISO Balancing Area.

<sup>9</sup> "Loop flow" is a phenomenon common to large electric power systems like the Western Electricity Coordinating Council. Power is scheduled to flow point-to-point on a Day-ahead and Hour-ahead basis through the CAISO. However, electric grid physics prevails and the actual power flow in real-time will differ from the pre-arranged scheduled flows. Loop flow is real, physical energy and it uses part of the available transfer capability on a path. If not accommodated, loop flow will cause overloading of lines, which can jeopardize the security and reliability of the grid.

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**C. Summary of Results by Local Area**

Each Local Capacity Area's overall requirement is determined by also achieving each sub-area requirement. Because these areas are a part of the interconnected electric system, the total for each Local Capacity Area is not simply a summation of the sub-area needs. For example, some sub-areas may overlap and therefore the same units may count for meeting the needs in both sub-areas.

**1. Humboldt Area**

**Area Definition**

The transmission tie lines into the area include:

- 1) Bridgeville-Cottonwood 115 kV line #1
- 2) Humboldt-Trinity 115 kV line #1
- 3) Willits-Garberville 60 kV line #1
- 4) Trinity-Maple Creek 60 kV line #1

The substations that delineate the Humboldt Area are:

- 1) Bridgeville and Low Gap are in, Cottonwood and First Glen are out
- 2) Humboldt is in, Trinity is out
- 3) Willits and Lytonville are out, Kekawaka and Garberville are in
- 4) Trinity is out, Ridge Cabin and Maple Creek are in

Total 2013 busload within the defined area: 200 MW with 10 MW of losses resulting in total load + losses of 210 MW.

Total units and qualifying capacity available in this area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB- AREA NAME	NQC Comments	CAISO Tag
BLULKE_6_BLUELK	31156	BLUELKPP	12.5	0.00	1	Humboldt 60 kV	Energy Only	Market
BRDGLV_7_BAKER				0.00		None	Not modeled Aug NQC	QF/Selfgen
FAIRHV_6_UNIT	31150	FAIRHAVN	13.8	14.69	1	Humboldt 60 kV	Aug NQC	QF/Selfgen
FTSWRD_7_QFUNTS				0.51		Humboldt 60 kV	Not modeled Aug NQC	QF/Selfgen
HUMBPP_1_UNITS3	31180	HUMB_G1	13.8	16.27	1	None		Market
HUMBPP_1_UNITS3	31180	HUMB_G1	13.8	16.27	2	None		Market

HUMBPP_1_UNITS3	31180	HUMB_G1	13.8	16.27	3	None		Market
HUMBPP_1_UNITS3	31180	HUMB_G1	13.8	16.27	4	None		Market
HUMBPP_6_UNITS1	31181	HUMB_G2	13.8	16.27	5	Humboldt 60 kV		Market
HUMBPP_6_UNITS1	31181	HUMB_G2	13.8	16.27	6	Humboldt 60 kV		Market
HUMBPP_6_UNITS1	31181	HUMB_G2	13.8	16.27	7	Humboldt 60 kV		Market
HUMBPP_6_UNITS2	31182	HUMB_G2	13.8	16.27	8	Humboldt 60 kV		Market
HUMBPP_6_UNITS2	31182	HUMB_G2	13.8	16.27	9	Humboldt 60 kV		Market
HUMBPP_6_UNITS2	31182	HUMB_G2	13.8	16.27	10	Humboldt 60 kV		Market
HUMBSB_1_QF				0.00		None	Not modeled Aug NQC	QF/Selfgen
KEKAWK_6_UNIT	31166	KEKAWAK	9.1	0.00	1	Humboldt 60 kV	Aug NQC	QF/Selfgen
LAPAC_6_UNIT	31158	LP SAMOA	12.5	20.00	1	Humboldt 60 kV		QF/Selfgen
PACLUM_6_UNIT	31152	PAC.LUMB	13.8	7.47	1	Humboldt 60 kV	Aug NQC	QF/Selfgen
PACLUM_6_UNIT	31152	PAC.LUMB	13.8	7.47	2	Humboldt 60 kV	Aug NQC	QF/Selfgen
PACLUM_6_UNIT	31153	PAC.LUMB	2.4	4.48	3	Humboldt 60 kV	Aug NQC	QF/Selfgen
WLLWCR_6_CEDRFL				0.02		Humboldt 60 kV	Not modeled Aug NQC	QF/Selfgen

**Major new projects modeled:**

1. Humboldt Reactive Support
2. Blue Lake generation project (energy only 0 MW NQC)
3. Garberville Reactive Support
4. Bridgeville 115/60 kV transformer replacement – PG&E maintenance project

**Critical Contingency Analysis Summary**

**Humboldt 60 kV Sub-area:**

The most critical contingency for the Humboldt 60 kV Sub-area area is the outage of the Humboldt 115/60 Transformer and one of the gen tie-line connecting the new Humboldt Bay units (on 60 kV side). The area limitation is the overload on the parallel Humboldt 115/60 kV Transformer. This contingency establishes a LCR of 174 MW in 2012 (includes 55 MW of QF/Selfgen generation as well as 22 MW of deficiency) as the minimum capacity necessary for reliable load serving capability within this area.

The most critical single contingency is the outage of the Humboldt 115/60 kV Transformer. The limitation is thermal overload on the parallel Humboldt 115/60 kV Transformer. This limiting contingency establishes a LCR of 125 MW in 2013 (includes 55 MW of QF/Selfgen generation).

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### Effectiveness factors:

The following table has units within the Humboldt 60 kV Sub-area area with at least 5% effective to the above-mentioned constraint.

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
31156	BLUELKPP	1	78
31150	FAIRHAVN	1	75
31158	LP SAMOA	1	75
31182	HUMB_G3	10	69
31182	HUMB_G3	9	69
31182	HUMB_G3	8	69
31181	HUMB_G2	7	69
31181	HUMB_G2	6	69
31181	HUMB_G2	5	69
31152	PAC.LUMB	1	42
31152	PAC.LUMB	2	42
31153	PAC.LUMB	3	42
31180	HUMB_G1	4	-14
31180	HUMB_G1	3	-14
31180	HUMB_G1	2	-14
31180	HUMB_G1	1	-14

### Humboldt overall:

The most critical contingency for the Humboldt area is the outage of the Bridgeville-Cottonwood 115 kV Line overlapping with an outage of one of the tie-line connecting the new Humboldt Bay units on the 115 kV side. The area limitation is the overload on the Humboldt – Trinity 115 kV Line. This contingency establishes a LCR of 190 MW in 2013 (includes 55 MW of QF/Selfgen generation) as the minimum capacity necessary for reliable load serving capability within this area.

For the single contingency, the most critical one is an outage of the Bridgeville-Cottonwood 115 kV Line when one of the Humboldt Bay Power Plant units connected to the 115 kV bus is out of service. The limitation is the overload on the Humboldt – Trinity 115 kV Line. This limiting contingency establishes a LCR of 143 MW in 2013 (includes 55 MW of QF/Selfgen generation).

### Effectiveness factors:

The following table has units within the Humboldt Overall system with at least 5% effective to the above-mentioned constraint

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
31156	BLUELKPP	1	65
31180	HUMB_G1	4	64
31180	HUMB_G1	3	64
31180	HUMB_G1	2	64
31180	HUMB_G1	1	64
31150	FAIRHAVN	1	61
31158	LP SAMOA	1	61
31182	HUMB_G3	10	61
31182	HUMB_G3	9	61
31182	HUMB_G3	8	61
31181	HUMB_G2	7	61
31181	HUMB_G2	6	61
31181	HUMB_G2	5	61
31152	PAC.LUMB	1	57
31152	PAC.LUMB	2	57
31153	PAC.LUMB	3	57

### Changes compared to last year's results:

The 2013 load and LCR needs remained the same as it they were in 2012.

### Humboldt Overall Requirements:

2013	QF/Selfgen (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	55	0	162	217

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>10</sup>	143	0	143
Category C (Multiple) <sup>11</sup>	190	22	212

<sup>10</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>11</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

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2. North Coast / North Bay Area

**Area Definition**

The transmission tie facilities coming into the North Coast/North Bay area are:

- 1) Cortina-Mendocino 115 kV Line
- 2) Cortina-Eagle Rock 115 kV Line
- 3) Willits-Garberville 60 kV line #1
- 4) Vaca Dixon-Lakeville 230 kV line #1
- 5) Tulucay-Vaca Dixon 230 kV line #1
- 6) Lakeville-Sobrante 230 kV line #1
- 7) Ignacio-Sobrante 230 kV line #1

The substations that delineate the North Coast/North Bay area are:

- 1) Cortina is out, Mendocino and Indian Valley are in
- 2) Cortina is out, Eagle Rock, Highlands and Homestake are in
- 3) Willits and Lytonville are in, Garberville and Kekawaka are out
- 4) Vaca Dixon is out Lakeville is in
- 5) Tulucay is in Vaca Dixon is out
- 6) Lakeville is in, Sobrante is out
- 7) Ignacio is in, Sobrante and Crocket are out

Total 2013 busload within the defined area: 1442 MW with 37 MW of losses resulting in total load + losses of 1479 MW.

Total units and qualifying capacity available in this area are shown in the following table:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB-AREA NAME	NQC Comments	CAISO Tag
ADLIN_1_UNITS	31435	GEO.ENGY	9.1	8.00	1	Eagle Rock, Fulton, Lakeville		Market
ADLIN_1_UNITS	31435	GEO.ENGY	9.1	8.00	2	Eagle Rock, Fulton, Lakeville		Market
BEARCN_2_UNITS	31402	BEAR CAN	13.8	6.50	1	Fulton, Lakeville		Market
BEARCN_2_UNITS	31402	BEAR CAN	13.8	6.50	2	Fulton, Lakeville		Market
FULTON_1_QF				0.06		Fulton, Lakeville	Not modeled Aug NQC	QF/Selfgen
GEYS11_7_UNIT11	31412	GEYSER11	13.8	65.00	1	Eagle Rock, Fulton, Lakeville		Market
GEYS12_7_UNIT12	31414	GEYSER12	13.8	50.00	1	Fulton, Lakeville		Market
GEYS13_7_UNIT13	31416	GEYSER13	13.8	56.00	1	Lakeville		Market
GEYS14_7_UNIT14	31418	GEYSER14	13.8	50.00	1	Fulton, Lakeville		Market
GEYS16_7_UNIT16	31420	GEYSER16	13.8	49.00	1	Fulton, Lakeville		Market
GEYS17_2_BOTRCK	31421	BOTTLERK	13.8	14.70	1	Fulton, Lakeville		Market
GEYS17_7_UNIT17	31422	GEYSER17	13.8	63.00	1	Fulton, Lakeville		Market

GEYS18_7_UNIT18	31424	GEYSER18	13.8	45.00	1	Lakeville		Market
GEYS20_7_UNIT20	31426	GEYSER20	13.8	40.00	1	Lakeville		Market
GYS5X6_7_UNITS	31406	GEYSR5-6	13.8	40.00	1	Eagle Rock, Fulton, Lakeville		Market
GYS5X6_7_UNITS	31406	GEYSR5-6	13.8	40.00	2	Eagle Rock, Fulton, Lakeville		Market
GYS7X8_7_UNITS	31408	GEYSER78	13.8	38.00	1	Eagle Rock, Fulton, Lakeville		Market
GYS7X8_7_UNITS	31408	GEYSER78	13.8	38.00	2	Eagle Rock, Fulton, Lakeville		Market
GYSRVL_7_WSPRNG				1.68		Fulton, Lakeville	Not modeled Aug NQC	QF/Selfgen
HIWAY_7_ACANYN				0.92		Lakeville	Not modeled Aug NQC	QF/Selfgen
IGNACO_1_QF				0.00		Lakeville	Not modeled Aug NQC	QF/Selfgen
INDVLY_1_UNITS	31436	INDIAN V	9.1	0.54	1	Eagle Rock, Fulton, Lakeville	Aug NQC	QF/Selfgen
MONTPH_7_UNITS	32700	MONTICLO	9.1	3.88	1	Fulton, Lakeville	Aug NQC	QF/Selfgen
MONTPH_7_UNITS	32700	MONTICLO	9.1	3.88	2	Fulton, Lakeville	Aug NQC	QF/Selfgen
MONTPH_7_UNITS	32700	MONTICLO	9.1	0.92	3	Fulton, Lakeville	Aug NQC	QF/Selfgen
NAPA_2_UNIT				0.01		Lakeville	Not modeled Aug NQC	QF/Selfgen
NCPA_7_GP1UN1	38106	NCPA1GY1	13.8	31.00	1	Lakeville	Aug NQC	MUNI
NCPA_7_GP1UN2	38108	NCPA1GY2	13.8	28.00	1	Lakeville	Aug NQC	MUNI
NCPA_7_GP2UN3	38110	NCPA2GY1	13.8	0.00	1	Fulton, Lakeville	Aug NQC	MUNI
NCPA_7_GP2UN4	38112	NCPA2GY2	13.8	52.73	1	Fulton, Lakeville	Aug NQC	MUNI
POTTER_6_UNITS	31433	POTTRVLY	2.4	4.70	1	Eagle Rock, Fulton, Lakeville	Aug NQC	Market
POTTER_6_UNITS	31433	POTTRVLY	2.4	2.25	3	Eagle Rock, Fulton, Lakeville	Aug NQC	Market
POTTER_6_UNITS	31433	POTTRVLY	2.4	2.25	4	Eagle Rock, Fulton, Lakeville	Aug NQC	Market
POTTER_7_VECINO				0.02		Eagle Rock, Fulton, Lakeville	Not modeled Aug NQC	QF/Selfgen
SANTFG_7_UNITS	31400	SANTA FE	13.8	30.00	1	Lakeville		Market
SANTFG_7_UNITS	31400	SANTA FE	13.8	30.00	2	Lakeville		Market
SMUDGO_7_UNIT 1	31430	SMUDGE01	13.8	37.00	1	Lakeville		Market
SNMALT_6_UNITS	31446	SONMA LF	9.1	4.60	1	Fulton, Lakeville	Aug NQC	QF/Selfgen
UKIAH_7_LAKEMN				1.70		Eagle Rock, Fulton, Lakeville	Not modeled	MUNI
WDFRDF_2_UNITS	31404	WEST FOR	13.8	12.51	1	Fulton, Lakeville		Market
WDFRDF_2_UNITS	31404	WEST FOR	13.8	12.49	2	Fulton, Lakeville		Market
New Unit	31447	S0476	4.2	0	1	Lakeville	Energy Only	Market

**Major new projects modeled:**

1. Lakeville-Ignacio #2 230 kV line
2. Fulton-Fitch Mountain 60 kV Line reconductoring

**Critical Contingency Analysis Summary**

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**Eagle Rock Sub-area**

The most critical contingency is the outage of Cortina-Mendocino 115 kV line and Geysers #5-Geysers #3 115 kV line. The sub-area area limitation is thermal overloading of the Eagle Rock-Cortina 115 kV line. This limiting contingency establishes a LCR of 235 MW in 2013 (includes 2 MW of QF/MUNI generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency is the outage of the Cortina-Mendocino 115 kV line with Geysers 11 generation unit out of service. The sub-area area limitation is thermal overloading of Eagle Rock-Cortina 115 kV line. This limiting contingency establishes a LCR of 215 MW in 2013 (includes 2MW of QF/MUNI generation).

**Effectiveness factors:**

The following units have at least 5% effective to the above-mentioned constraint:

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
31406	GEYSR5-6	1	38
31406	GEYSR5-6	2	38
31408	GEYSER78	1	38
31408	GEYSER78	2	38
31412	GEYSER11	1	38
31435	GEO.ENG	1	38
31435	GEO.ENG	2	38
31433	POTTRVLY	1	36
31433	POTTRVLY	3	36
31433	POTTRVLY	4	36

**Fulton Sub-area**

The most critical contingency is the outage of Lakeville-Fulton 230 kV line #1 and Fulton-Ignacio 230 kV line #1. The sub-area limitation is thermal overloading of Santa Rosa-Corona 115 kV line #1. This limiting contingency establishes a LCR of 301 MW in 2013 (includes 16 MW of QF and 54 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area. All of the resources needed to meet the Eagle Rock sub-area count towards the Fulton sub-area LCR need.

**Effectiveness factors:**

The following units have at least 5% effective to the above-mentioned constraint:

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
31404	WEST FOR	2	57
31402	BEAR CAN	1	57
31402	BEAR CAN	2	57
31404	WEST FOR	1	57
31414	GEYSER12	1	57
31418	GEYSER14	1	57
31420	GEYSER16	1	57
31422	GEYSER17	1	57
38110	NCPA2GY1	1	57
38112	NCPA2GY2	1	57
31421	BOTTLERK	1	57
31406	GEYSR5-6	1	31
31406	GEYSR5-6	2	31
31408	GEYSER78	1	31
31408	GEYSER78	2	31
31412	GEYSER11	1	31
31435	GEO.ENG	1	31
31435	GEO.ENG	2	31

**Lakeville Sub-area**

The most limiting contingency is the outage of Vaca Dixon-Tulucay 230 kV line with DEC power plant out of service. The area limitation is thermal overloading of Vaca Dixon-Lakeville 230 kV. This limiting contingency establishes a LCR of 629 MW in 2013 (includes 17 MW of QF and 113 MW of MUNI generation). The LCR resources needed for Eagle Rock and Fulton sub-areas can be counted toward fulfilling the requirement of Lakeville sub-area.

**Effectiveness factors:**

The following units have at least 5% effective to the above-mentioned constraint:

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
31400	SANTA FE	2	38
31430	SMUDGE01	1	38
31400	SANTA FE	1	38
31416	GEYSER13	1	38
31424	GEYSER18	1	38
31426	GEYSER20	1	38
38106	NCPA1GY1	1	38
38108	NCPA1GY2	1	38
31447	S0476	1	38
31421	BOTTLERK	1	36
31404	WEST FOR	2	36

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31402	BEAR CAN	1	36
31402	BEAR CAN	2	36
31404	WEST FOR	1	36
31414	GEYSER12	1	36
31418	GEYSER14	1	36
31420	GEYSER16	1	36
31422	GEYSER17	1	36
38110	NCPA2GY1	1	36
38112	NCPA2GY2	1	36
31446	SONMA LF	1	36
32700	MONTICLO	1	31
32700	MONTICLO	2	31
32700	MONTICLO	3	31
31406	GEYSR5-6	1	18
31406	GEYSR5-6	2	18
31408	GEYSER78	1	18
31408	GEYSER78	2	18
31412	GEYSER11	1	18
31435	GEO.ENG	1	18
31435	GEO.ENG	2	18
31433	POTTRVLY	1	15
31433	POTTRVLY	2	15
31433	POTTRVLY	3	15

**Changes compared to last year's results:**

The load forecast went up by 59 MW and the LCR need went up by 16 MW.

**North Coast/North Bay Overall Requirements:**

2013	QF/Selfgen (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	17	113	739	869

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>12</sup>	629	0	629
Category C (Multiple) <sup>13</sup>	629	0	629

<sup>12</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>13</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

**3. Sierra Area**

**Area Definition**

The transmission tie lines into the Sierra Area are:

- 1) Table Mountain-Rio Oso 230 kV line
- 2) Table Mountain-Palermo 230 kV line
- 3) Table Mt-Pease 60 kV line
- 4) Caribou-Palermo 115 kV line
- 5) Drum-Summit 115 kV line #1
- 6) Drum-Summit 115 kV line #2
- 7) Spaulding-Summit 60 kV line
- 8) Brighton-Bellota 230 kV line
- 9) Rio Oso-Lockeford 230 kV line
- 10) Gold Hill-Eight Mile Road 230 kV line
- 11) Lodi STIG-Eight Mile Road 230 kV line
- 12) Gold Hill-Lake 230 kV line

The substations that delineate the Sierra Area are:

- 1) Table Mountain is out Rio Oso is in
- 2) Table Mountain is out Palermo is in
- 3) Table Mt is out Pease is in
- 4) Caribou is out Palermo is in
- 5) Drum is in Summit is out
- 6) Drum is in Summit is out
- 7) Spaulding is in Summit is out
- 8) Brighton is in Bellota is out
- 9) Rio Oso is in Lockeford is out
- 10) Gold Hill is in Eight Mile is out
- 11) Lodi STIG is in Eight Mile Road is out
- 12) Gold Hill is in Lake is out

Total 2013 busload within the defined area: 1639 MW with 99 MW of losses resulting in total load + losses of 1738 MW.

Total units and qualifying capacity available in this area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB-AREA NAME	NQC Comments	CAISO Tag
BELDEN_7_UNIT 1	31784	BELDEN	13.8	115.00	1	South of Palermo, South of Table Mountain	Aug NQC	Market
BIOMAS_1_UNIT 1	32156	WOODLAN D	9.1	22.80	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	QF/Selfgen

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BNNIEN_7_ALTAPH	32376	BONNIE N	60	0.67		Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Not modeled Aug NQC	Market
BOGUE_1_UNITA1	32451	FREC	13.8	45.00	1	Bogue, Drum-Rio Oso, South of Table Mountain	Aug NQC	Market
BOWMN_6_UNIT	32480	BOWMAN	9.1	2.68	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
BUCKCK_7_OAKFLT				0.87		South of Palermo, South of Table Mountain	Not modeled Aug NQC	Market
BUCKCK_7_PL1X2	31820	BCKS CRK	11	29.00	1	South of Palermo, South of Table Mountain	Aug NQC	Market
BUCKCK_7_PL1X2	31820	BCKS CRK	11	29.00	2	South of Palermo, South of Table Mountain	Aug NQC	Market
CHICPK_7_UNIT 1	32462	CHI.PARK	11.5	38.00	1	Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
COLGAT_7_UNIT 1	32450	COLGATE1	13.8	161.65	1	South of Table Mountain	Aug NQC	MUNI
COLGAT_7_UNIT 2	32452	COLGATE2	13.8	161.68	1	South of Table Mountain	Aug NQC	MUNI
CRESTA_7_PL1X2	31812	CRESTA	11.5	35.00	1	South of Palermo, South of Table Mountain	Aug NQC	Market
CRESTA_7_PL1X2	31812	CRESTA	11.5	35.00	2	South of Palermo, South of Table Mountain	Aug NQC	Market
DAVIS_7_MNMETH				2.04		Drum-Rio Oso, South of Palermo, South of Table Mountain	Not modeled Aug NQC	Market
DEADCK_1_UNIT	31862	DEADWOOD	9.1	0.00	1	Drum-Rio Oso, South of Table Mountain	Aug NQC	MUNI
DEERCR_6_UNIT 1	32474	DEER CRK	9.1	3.61	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
DRUM_7_PL1X2	32504	DRUM 1-2	6.6	13.00	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
DRUM_7_PL1X2	32504	DRUM 1-2	6.6	13.00	2	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
DRUM_7_PL3X4	32506	DRUM 3-4	6.6	13.70	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market

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DRUM_7_PL3X4	32506	DRUM 3-4	6.6	13.70	2	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
DRUM_7_UNIT 5	32454	DRUM 5	13.8	49.50	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
DUTCH1_7_UNIT 1	32464	DTCHFLT1	11	22.00	1	Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
DUTCH2_7_UNIT 1	32502	DTCHFLT2	6.9	26.00	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
ELDORO_7_UNIT 1	32513	ELDRADO1	21.6	11.00	1	Placerville, South of Rio Oso, South of Palermo, South of Table Mountain		Market
ELDORO_7_UNIT 2	32514	ELDRADO2	21.6	11.00	1	Placerville, South of Rio Oso, South of Palermo, South of Table Mountain		Market
FMEADO_6_HELLHL	32486	HELLHOLE	9.1	0.54	1	South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
FMEADO_7_UNIT	32508	FRNCH MD	4.2	16.01	1	South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
FORBST_7_UNIT 1	31814	FORBSTWN	11.5	39.00	1	Drum-Rio Oso, South of Table Mountain	Aug NQC	MUNI
GOLDHL_1_QF				0.00		Placerville, South of Rio Oso, South of Palermo, South of Table Mountain	Not modeled	QF/Selfgen
GRNLF1_1_UNITS	32490	GRNLEAF1	13.8	5.47	1	Bogue, Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
GRNLF1_1_UNITS	32490	GRNLEAF1	13.8	27.97	2	Bogue, Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
GRNLF2_1_UNIT	32492	GRNLEAF2	13.8	34.00	1	Pease, Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
HALSEY_6_UNIT	32478	HALSEY F	9.1	7.01	1	Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
HAYPRS_6_QFUNTS	32488	HAYPRES+	9.1	0.00	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	QF/Selfgen
HAYPRS_6_QFUNTS	32488	HAYPRES+	9.1	0.00	2	Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	QF/Selfgen

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HIGGNS_7_QFUNTS				0.11	Mountain Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Not modeled Aug NQC	QF/Selfgen
KANAKA_1_UNIT				0.00	Drum-Rio Oso, South of Table Mountain	Not modeled Aug NQC	MUNI
KELRG_6_UNIT	31834	KELLYRDG	9.1	10.00	1 Drum-Rio Oso, South of Table Mountain	Aug NQC	MUNI
MDFKRL_2_PROJECT	32456	MIDLFORK	13.8	62.18	1 South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
MDFKRL_2_PROJECT	32456	MIDLFORK	13.8	62.18	2 South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
MDFKRL_2_PROJECT	32458	RALSTON	13.8	84.32	1 South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
NAROW1_2_UNIT	32466	NARROWS1	9.1	6.29	1 South of Table Mountain	Aug NQC	Market
NAROW2_2_UNIT	32468	NARROWS2	9.1	22.59	1 South of Table Mountain	Aug NQC	MUNI
NWCSTL_7_UNIT 1	32460	NEWCASTLE	13.2	0.03	1 Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
OROVIL_6_UNIT	31888	OROVILLE	9.1	4.61	1 Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
OXBOW_6_DRUM	32484	OXBOW F	9.1	6.00	1 Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
PACORO_6_UNIT	31890	PO POWER	9.1	7.56	1 Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
PACORO_6_UNIT	31890	PO POWER	9.1	7.57	2 Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
PLACVL_1_CHILIB	32510	CHILIBAR	4.2	2.18	1 Placerville, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
PLACVL_1_RCKCRE				0.00	Placerville, South of Rio Oso, South of Palermo, South of Table Mountain	Not modeled Aug NQC	Market
PLSNTG_7_LNCLND	32408	PLSNT GR	60	1.24	Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Not modeled Aug NQC	Market
POEPH_7_UNIT 1	31790	POE 1	13.8	60.00	1 South of Palermo, South of Table	Aug NQC	Market

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POEPH_7_UNIT 2	31792	POE 2	13.8	60.00	1 Mountain South of Palermo, South of Table Mountain	Aug NQC	Market
RCKCRK_7_UNIT 1	31786	ROCK CK1	13.8	56.00	1 South of Palermo, South of Table Mountain	Aug NQC	Market
RCKCRK_7_UNIT 2	31788	ROCK CK2	13.8	56.00	1 South of Palermo, South of Table Mountain	Aug NQC	Market
RIOOSO_1_QF				1.12	Drum-Rio Oso, South of Palermo, South of Table Mountain	Not modeled Aug NQC	QF/Selfgen
ROLLIN_6_UNIT	32476	ROLLINSF	9.1	11.09	1 Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	MUNI
SLYCRK_1_UNIT 1	31832	SLY.CR.	9.1	10.36	1 Drum-Rio Oso, South of Table Mountain	Aug NQC	MUNI
SPAULD_6_UNIT 3	32472	SPAULDG	9.1	5.80	3 Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
SPAULD_6_UNIT12	32472	SPAULDG	9.1	4.96	1 Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
SPAULD_6_UNIT12	32472	SPAULDG	9.1	4.96	2 Drum-Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
SPI LI_2_UNIT 1	32498	SPLINCF	12.5	10.49	1 Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	QF/Selfgen
STIGCT_2_LODI	38114	Stig CC	13.8	49.50	1 South of Rio Oso, South of Palermo, South of Table Mountain		MUNI
ULTRCK_2_UNIT	32500	ULTR RCK	9.1	20.74	1 Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	QF/Selfgen
WDLEAF_7_UNIT 1	31794	WOODLEAF	13.8	55.00	1 Drum-Rio Oso, South of Table Mountain	Aug NQC	MUNI
WHEATL_6_LNDFIL	32350	WHEATLND	60	1.20	South of Table Mountain	Not modeled Aug NQC	Market
WISE_1_UNIT 1	32512	WISE	12	10.82	1 Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of Table Mountain	Aug NQC	Market
WISE_1_UNIT 2	32512	WISE	12	0.34	1 Placer, Drum-Rio Oso, South of Rio Oso, South of Palermo, South of	Aug NQC	Market

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						Table Mountain		
YUBACT_1_SUNSW T	32494	YUBA CTY	9.1	24.80	1	Pease, Drum-Rio Oso, South of Table Mountain	Aug NQC	QF/Selfgen
YUBACT_6_UNITA1	32496	YCEC	13.8	46.00	1	Pease, Drum-Rio Oso, South of Table Mountain		Market
CAMPFW_7_FARWS T	32470	CMP.FARW	9.1	4.60	1	South of Table Mountain	No NQC - hist. data	MUNI
NA	32162	RIV.DLTA	9.11	0.00	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	No NQC - hist. data	QF/Selfgen
UCDAVS_1_UNIT	32166	UC DAVIS	9.1	3.50	1	Drum-Rio Oso, South of Palermo, South of Table Mountain	No NQC - hist. data	QF/Selfgen
STIGCT_2_LODIEC	38123	Q267CT1	18	166.00	1	South of Rio Oso, South of Palermo, South of Table Mountain	No NQC - Pmax	MUNI
STIGCT_2_LODIEC	38124	Q267ST1	18	114.00	1	South of Rio Oso, South of Palermo, South of Table Mountain	No NQC - Pmax	MUNI

**Major new projects modeled:**

1. Table Mountain-Rio Oso Reconnector and Tower Upgrade
2. Atlantic-Lincoln 115 kV Transmission Upgrade
3. Gold Hill – Horseshoe 115 kV line Reconductoring
4. Palermo-Rio Oso 115 kV Reconductoring
5. Lodi Energy Center

**Critical Contingency Analysis Summary**

***South of Table Mountain Sub-area***

The most critical contingency is the loss of the Table Mountain-Rio Oso 230 kV and Table Mountain-Palermo double circuit tower line outage. The area limitation is thermal overloading of the Caribou-Palermo 115 kV line. This limiting contingency establishes in 2013 a LCR of 1376 MW (includes 171 MW of QF and 1103 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this area.

The units required for the South of Palermo sub-area satisfy the single contingency

requirement for this sub-area.

**Effectiveness factors:**

The following table has all units in Sierra area and their effectiveness factor to the above-mentioned constraint.

Gen Bus	Gen Name	Gen ID	Eff	Fctr. (%)
31814	FORBSTWN	1	8	
31794	WOODLEAF	1	8	
31832	SLY.CR.	1	7	
31862	DEADWOOD	1	7	
31888	OROVILLE	1	6	
31890	PO POWER	2	6	
31890	PO POWER	1	6	
31834	KELLYRDG	1	6	
32452	COLGATE2	1	5	
32450	COLGATE1	1	5	
32466	NARROWS1	1	5	
32468	NARROWS2	1	5	
32470	CMP.FARW	1	5	
32451	FREC	1	5	
32490	GRNLEAF1	2	4	
32490	GRNLEAF1	1	4	
32496	YCEC	1	3	
32494	YUBA CTY	1	3	
32492	GRNLEAF2	1	3	
32156	WOODLAND	1	3	
31820	BCKS CRK	1	2	
31820	BCKS CRK	2	2	
31788	ROCK CK2	1	2	
31812	CRESTA	1	2	
31812	CRESTA	2	2	
31792	POE 2	1	2	
31790	POE 1	1	2	
31786	ROCK CK1	1	2	
31784	BELDEN	1	2	
32166	UC DAVIS	1	2	
32500	ULTR RCK	1	2	
32498	SPLINCF	1	2	
32162	RIV.DLTA	1	2	
32510	CHILIBAR	1	2	
32514	ELDRADO2	1	2	
32513	ELDRADO1	1	2	
32478	HALSEY F	1	2	
32458	RALSTON	1	2	
32456	MIDLFORK	1	2	

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32456	MIDLFORK	2	2
38114	Stig CC	1	2
32460	NEWCASTLE	1	2
32512	WISE	1	2
32486	HELLHOLE	1	2
32508	FRNCH MD	1	2
32502	DTCHFLT2	1	2
32462	CHI.PARK	1	2
32464	DTCHFLT1	1	1
32454	DRUM 5	1	1
32476	ROLLINSF	1	1
32484	OXBOW F	1	1
32474	DEER CRK	1	1
32506	DRUM 3-4	1	1
32506	DRUM 3-4	2	1
32504	DRUM 1-2	1	1
32504	DRUM 1-2	2	1
32488	HAYPRES+	1	1
32488	HAYPRES+	2	1
32480	BOWMAN	1	1
32472	SPAULDG	1	1
32472	SPAULDG	2	1
32472	SPAULDG	3	1
38123	Q267CT1	1	1
38124	Q267ST1	1	1

**Colgate Sub-area**

No requirements due to the addition of the Atlantic-Lincoln 115 kV transmission upgrade project. If this project is delayed all units within this area (Narrows #1 & #2 and Camp Far West) are needed.

**Pease Sub-area**

The most critical contingency is the loss of the Palermo-East Nicolaus 115 kV line with Yuba City Energy Center unit out of service. The area limitation is thermal overloading of the Palermo-Pease 115 kV line. This limiting contingency establishes a LCR of 52 MW (includes 59 MW of QF generation) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

All units within this area (Greenleaf #2, Yuba City and Yuba City EC) have the same

effectiveness factor.

**Bogue Sub-area**

No requirement due to the Palermo-Rio Oso Reconductoring Project. If this project is delayed all units within this area (Greenleaf #1 units 1&2 and Feather River EC) are needed.

**South of Palermo Sub-area**

The most critical contingency is the loss of the Double Circuit Tower Line Table Mountain-Rio Oso and Colgate-Rio Oso 230 kV lines. The area limitation is thermal overloading of the Pease-Rio Oso 115 kV line. This limiting contingency establishes a LCR of 1568 MW (includes 59 MW of QF and 639 MW of Muni generation as well as 204 MW of deficiency) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency is the loss of the Palermo- East Nicolaus 115 kV line with Belden unit out of service. The area limitation is thermal overloading of the Pease-Rio Oso 115 kV line. This contingency establishes in 2013 a LCR of 1247 MW (includes 59 MW of QF and 639 MW of Muni generation).

**Effectiveness factors:**

All units within the South of Palermo are needed therefore no effectiveness factor is required.

**Placerville Sub-area**

The most critical contingency is the loss of the Gold Hill-Clarksville 115 kV line followed by loss of the Gold Hill-Missouri Flat #2 115 kV line. The area limitation is thermal overloading of the Gold Hill-Missouri Flat #1 115 kV line. This limiting contingency establishes a LCR of 72 MW (includes 0 MW of QF and Muni generation as well as 48 MW of deficiency) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

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### Effectiveness factors:

All units within this area (El Dorado units 1&2 and Chili Bar) are needed therefore no effectiveness factor is required.

### Placer Sub-area

The most critical contingency is the loss of the Gold Hill-Placer #1 115 kV line followed by loss of the Gold Hill-Placer #2 115 kV line. The area limitation is thermal overloading of the Drum-Higgins 115 kV line. This limiting contingency establishes a LCR of 81 MW (includes 38 MW of QF and Muni generation as well as 2 MW of deficiency) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

The single most critical contingency is the loss of the Gold Hill-Placer #2 115 kV line with Chicago Park unit out of service. The area limitation is thermal overloading of the Drum-Higgins 115 kV line. This limiting contingency establishes a local capacity need of 59 MW (includes 38 MW of QF and Muni generation) in 2013.

### Effectiveness factors:

All units within this area (Chicago Park, Dutch Flat#1, Wise units 1&2, Newcastle and Halsey) have the same effectiveness factor.

### Drum-Rio Oso Sub-area

The most critical contingency is the loss of the Rio Oso #2 230/115 transformer followed by loss of the Rio Oso-Brighton 230 kV line. The area limitation is thermal overloading of the Rio Oso #1 230/115 kV transformer. This limiting contingency establishes in 2013 a LCR of 522 MW (includes 171 MW of QF and 198 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

The single most critical contingency is the loss of the Rio Oso #2 230/115 transformer. The area limitation is thermal overloading of the Rio Oso #1 230/115 kV transformer. This limiting contingency establishes in 2013 a LCR of 226 MW (includes 171 MW of QF and 198 MW of Muni generation).

### Effectiveness factors:

The following table has all units in Drum-Rio Oso sub-area and their effectiveness factor to the above-mentioned constraint.

Gen Bus	Gen Name	Gen ID	Eff Fctr. (%)
32156	WOODLAND	1	22
32490	GRNLEAF1	1	22
32490	GRNLEAF1	2	22
32451	FREC	1	21
32166	UC DAVIS	1	18
32498	SPILINCF	1	15
32502	DTCHFLT2	1	15
32494	YUBA CTY	1	14
32496	YCEC	1	14
32492	GRNLEAF2	1	13
32454	DRUM 5	1	13
32476	ROLLINSF	1	13
32474	DEER CRK	1	13
32504	DRUM 1-2	1	13
32504	DRUM 1-2	2	13
32506	DRUM 3-4	1	13
32506	DRUM 3-4	2	13
32484	OXBOW F	1	13
32472	SPAULDG	3	12
32472	SPAULDG	1	12
32472	SPAULDG	2	12
32488	HAYPRES+	1	12
32480	BOWMAN	1	12
32488	HAYPRES+	2	12
32464	DTCHFLT1	1	11
32162	RIV.DLTA	1	11
32462	CHI.PARK	1	9
32500	ULTR RCK	1	6
31862	DEADWOOD	1	5
31814	FORBSTWN	1	5
31832	SLY.CR.	1	5
31794	WOODLEAF	1	5
32478	HALSEY F	1	2
31888	OROVLE	1	2
32512	WISE	1	2
31834	KELLYRDG	1	2
31890	PO POWER	1	2
31890	PO POWER	2	2
32460	NEWCSTLE	1	1

### South of Rio Oso Sub-area

The most critical contingency is the loss of the Rio Oso-Gold Hill 230 line followed by

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loss of the Rio Oso-Lincoln 115 kV line or vice versa. The area limitation is thermal overloading of the Rio Oso-Atlantic 230 kV line. This limiting contingency establishes a LCR of 500 MW (includes 31 MW of QF and 593 MW of Muni generation) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

The single most critical contingency is the loss of the Rio Oso-Gold Hill 230 line with the Ralston unit out of service. The area limitation is thermal overloading of the Rio Oso-Atlantic 230 kV line. This limiting contingency establishes a LCR of 333 MW (includes 31 MW of QF and 593 MW of Muni generation) in 2013.

### Effectiveness factors:

The following table has all units in South of Rio Oso sub-area and their effectiveness factor to the above-mentioned constraint.

Gen Bus	Gen Name	Gen ID	Eff Fctr. (%)
32498	SPILINCF	1	49
32500	ULTR RCK	1	49
32456	MIDLFORK	1	33
32456	MIDLFORK	2	33
32458	RALSTON	1	33
32513	ELDRADO1	1	32
32514	ELDRADO2	1	32
32510	CHILIBAR	1	32
32486	HELLHOLE	1	31
32508	FRNCH MD	1	30
32460	NEWCSTLE	1	26
32478	HALSEY F	1	24
32512	WISE	1	24
38114	Stig CC	1	14
38123	Q267CT	1	14
38124	Q267ST	1	14
32462	CHI.PARK	1	8
32464	DTCHFLT1	1	4

### Changes compared to last year's results:

The Sierra Area load forecast went down by 78 MW and the LCR need has decreased by 44 MW.

### Sierra Overall Requirements:

2013	QF (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	171	1103	765	2039

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>14</sup>	1408	0	1408
Category C (Multiple) <sup>15</sup>	1712	218	1930

## 4. Stockton Area

### Area Definition

The transmission facilities that establish the boundary of the Tesla-Bellota Sub-area are:

- 1) Bellota 230/115 kV Transformer #1
- 2) Bellota 230/115 kV Transformer #2
- 3) Tesla-Tracy 115 kV Line
- 4) Tesla-Salado 115 kV Line
- 5) Tesla-Salado-Manteca 115 kV line
- 6) Tesla-Schulte #1 115 kV Line
- 7) Tesla-Schulte #2 115 kV Line

The substations that delineate the Tesla-Bellota Sub-area are:

- 1) Bellota 230 kV is out Bellota 115 kV is in
- 2) Bellota 230 kV is out Bellota 115 kV is in
- 3) Tesla is out Tracy is in
- 4) Tesla is out Salado is in
- 5) Tesla is out Salado and Manteca are in
- 6) Tesla is out Schulte is in
- 7) Tesla is out Schulte is in

The transmission facilities that establish the boundary of the Lockeford Sub-area are:

- 1) Lockeford-Industrial 60 kV line
- 2) Lockeford-Lodi #1 60 kV line

<sup>14</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>15</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

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- 3) Lockeford-Lodi #2 60 kV line
- 4) Lockeford-Lodi #3 60 kV line

The substations that delineate the Lockeford Sub-area are:

- 1) Lockeford is out Industrial is in
- 2) Lockeford is out Lodi is in
- 3) Lockeford is out Lodi is in
- 4) Lockeford is out Lodi is in

The transmission facilities that establish the boundary of the Weber Sub-area are:

- 1) Weber 230/60 kV Transformer #1
- 2) Weber 230/60 kV Transformer #2
- 3) Weber 230/60 kV Transformer #2a

The substations that delineate the Weber Sub-area are:

- 1) Weber 230 kV is out Weber 60 kV is in
- 2) Weber 230 kV is out Weber 60 kV is in
- 3) Weber 230 kV is out Weber 60 kV is in

Total 2013 busload within the defined area: 1090 MW with 19 MW of losses resulting in total load + losses of 1109 MW.

Total units and qualifying capacity available in this area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB- AREA NAME	NQC Comments	CAISO Tag
BEARDS_7_UNIT 1	34074	BEARDSLY	6.9	8.36	1	Tesla-Bellota	Aug NQC	MUNI
CURIS_1_QF				0.84		Tesla-Bellota	Not modeled Aug NQC	QF/Selfgen
DONNLS_7_UNIT	34058	DONNELLS	13.8	72.00	1	Tesla-Bellota	Aug NQC	MUNI
LODI25_2_UNIT 1	38120	LODI25CT	9.11	22.70	1	Lockeford		MUNI
PHOENX_1_UNIT				1.41		Tesla-Bellota	Not modeled Aug NQC	Market
SCHLTE_1_PL1X3	33805	GWFTRCY1	13.8	83.56	1	Tesla-Bellota		Market
SCHLTE_1_PL1X3	33807	GWFTRCY2	13.8	82.88	1	Tesla-Bellota		Market
SNDBAR_7_UNIT 1	34060	SANDBAR	13.8	12.02	1	Tesla-Bellota	Aug NQC	MUNI
SPIFBD_1_PL1X2	33917	FBERBORD	115	1.91	1	Tesla-Bellota	Aug NQC	QF/Selfgen
SPRGAP_1_UNIT 1	34078	SPRNG GP	6	0.04	1	Tesla-Bellota	Aug NQC	Market
STANIS_7_UNIT 1	34062	STANISLS	13.8	91.00	1	Tesla-Bellota	Aug NQC	Market
STNRES_1_UNIT	34056	STNLSRP	13.8	15.98	1	Tesla-Bellota	Aug NQC	QF/Selfgen
STOKCG_1_UNIT 1	33814	CPC STCN	12.5	34.91	1	Tesla-Bellota	Aug NQC	QF/Selfgen
TULLCK_7_UNITS	34076	TULLOCH	6.9	8.23	1	Tesla-Bellota	Aug NQC	MUNI
TULLCK_7_UNITS	34076	TULLOCH	6.9	8.24	2	Tesla-Bellota	Aug NQC	MUNI
ULTPCH_1_UNIT 1	34050	CH.STN.	13.8	15.17	1	Tesla-Bellota	Aug NQC	QF/Selfgen
VLYHOM_7_SSJID				1.39		Tesla-Bellota	Not modeled Aug NQC	QF/Selfgen
CAMCHE_1_PL1X3	33850	CAMANCHE	4.2	3.50	1	Tesla-Bellota	No NQC - hist. data	MUNI
CAMCHE_1_PL1X3	33850	CAMANCHE	4.2	3.50	2	Tesla-Bellota	No NQC - hist. data	MUNI
CAMCHE_1_PL1X3	33850	CAMANCHE	4.2	3.50	3	Tesla-Bellota	No NQC - hist. data	MUNI

NA	33687	STKTN WW	60	1.50	1	Weber	No NQC - hist. data	QF/Selfgen
NA	33830	GEN.MILL	9.11	2.50	1	Lockeford	No NQC - hist. data	QF/Selfgen
COGNAT_1_UNIT	33818	COG.NTNL	12	0.00	1	Weber	Retired	QF/Selfgen
SCHLTE_1_PL1X3	33811	GWFTRCY3	13.8	145	1	Tesla-Bellota	No NQC - Pmax	Market

**Major new projects modeled:**

1. Weber 230/60 kV Transformer Replacement
2. Weber-Stockton "A" #1 & #2 60 kV Reconductoring
3. GWF Tracy Expansion – Loop in Tesla-Manteca 115 kV line to Schulte switching station.
4. GWF Tracy (145 MW) connecting to Schulte 115 kV switching station.

**Critical Contingency Analysis Summary**

***Stockton overall***

The requirement for this area is driven by the sum of requirements for the Tesla-Bellota, Lockeford, Stagg and Weber Sub-areas.

***Tesla-Bellota Sub-area***

The two most critical contingencies listed below together establish a local capacity need of 518 MW (includes 70 MW of QF and 119 MW of Muni generation as well as 130 MW of deficiency) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

The most critical contingency for the Tesla-Bellota pocket is the loss of Schulte-Kasson-Manteca 115 kV and Schulte-Lammers 115 kV. The area limitation is thermal overload of the Tesla-Tracy 115 kV line above its emergency rating. This limiting contingency establishes a local capacity need of 412 MW (includes 70 MW of QF and 119 MW of Muni generation as well as 130 MW of deficiency) in 2013.

The second most critical contingency for the Tesla-Bellota pocket is the loss of Tesla-Tracy 115 kV and Tesla-Schulte #2 115 kV lines. The area limitation is thermal overload of the Tesla-Schulte #1 115 kV line. This limiting contingency establishes a 2013 local capacity need of 388 MW (includes 70 MW of QF and 119 MW of Muni

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generation).

The single most critical contingency for the Tesla-Bellota pocket is the loss of Tesla-Tracy 115 kV line and the loss of the GWF Tracy unit #3. The area limitation is thermal overload of the Tesla-Schulte #1 115 kV line. This single contingency establishes a local capacity need of 242 MW (includes 70 MW of QF and 119 MW of Muni generation) in 2013.

### Effectiveness factors:

All units within this sub-area are needed for the most limiting contingencies therefore no effectiveness factor is required.

### Lockeford Sub-area

The critical contingency for the Lockeford area is the loss of Lockeford-Industrial 60 kV circuit and Lockeford-Lodi #2 60 kV circuit. The area limitation is thermal overloading of the Lockeford-Lodi Jct. section of the Lockeford-Lodi #3 60 kV circuit. This limiting contingency establishes a 2013 local capacity need of 49 MW (including 2 MW of QF and 23 MW of Muni generation as well as 24 MW of deficiency) as the minimum capacity necessary for reliable load serving capability within this area.

### Effectiveness factors:

All units within this sub-area are needed therefore no effectiveness factor is required.

### Weber Sub-area

No requirement due to the Weber 230/60 kV transformer replacement and Weber – Stockton “A” #1 & 2 60 kV lines reconductoring projects. If these projects are delayed all units within this sub-area (Cogeneration National and Stockton Wastewater) are needed.

### Changes compared to last year’s results:

Overall the Stockton area load forecast went up by 23 MW. There are a few

transmission upgrade modeled and one new generation project modeled (GWF Tracy Expansion – Loop in the Tesla-Manteca 115 kV line to Schulte switching station) in the Stockton local area compared to last year studies. The Weber sub-area is eliminated because of the Weber 230/60 kV transformer upgrade and Weber – Stockton “A” #1 & 2 60 kV lines reconductoring projects. As a result, the overall requirement for the Stockton area stayed the same as last year.

### Stockton Overall Requirements:

2013	QF (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	74	142	404	620

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>16</sup>	242	0	242
Category C (Multiple) <sup>17</sup>	413	154	567

## 5. Greater Bay Area

### Area Definition

The transmission tie lines into the Greater Bay Area are:

- 1) Lakeville-Sobrante 230 kV
- 2) Ignacio-Sobrante 230 kV
- 3) Parkway-Moraga 230 kV
- 4) Bahia-Moraga 230 kV
- 5) Lambie SW Sta-Vaca Dixon 230 kV
- 6) Peabody-Birds Landing SW Sta 230 kV
- 7) Tesla-Kelso 230 kV
- 8) Tesla-Delta Switching Yard 230 kV
- 9) Tesla-Pittsburg #1 230 kV
- 10) Tesla-Pittsburg #2 230 kV
- 11) Tesla-Newark #1 230 kV

<sup>16</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>17</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

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- 12) Tesla-Newark #2 230 kV
- 13) Tesla-Ravenswood 230 kV
- 14) Tesla-Metcalf 500 kV
- 15) Moss Landing-Metcalf 500 kV
- 16) Moss Landing-Metcalf #1 230 kV
- 17) Moss Landing-Metcalf #2 230 kV
- 18) Oakdale TID-Newark #1 115 kV
- 19) Oakdale TID-Newark #2 115 kV

The substations that delineate the Greater Bay Area are:

- 1) Lakeville is out Sobrante is in
- 2) Ignacio is out Crocket and Sobrante are in
- 3) Parkway is out Moraga is in
- 4) Bahia is out Moraga is in
- 5) Lambie SW Sta is in Vaca Dixon is out
- 6) Peabody is out Birds Landing SW Sta is in
- 7) Tesla and USWP Ralph are out Kelso is in
- 8) Tesla and Altmont Midway are out Delta Switching Yard is in
- 9) Tesla and Tres Vaqueros are out Pittsburg is in
- 10) Tesla and Flowind are out Pittsburg is in
- 11) Tesla is out Newark is in
- 12) Tesla is out Newark and Patterson Pass are in
- 13) Tesla is out Ravenswood is in
- 14) Tesla is out Metcalf is in
- 15) Moss Landing is out Metcalf is in
- 16) Moss Landing is out Metcalf is in
- 17) Moss Landing is out Metcalf is in
- 18) Oakdale TID is out Newark is in
- 19) Oakdale TID is out Newark is in

Total 2013 bus load within the defined area is 9770 MW with 199 MW of losses and 264 MW of pumps resulting in total load + losses + pumps of 10233 MW. This corresponds to about 9633 MW of load per CEC forecast since there are about 600 MW of loads behind the meter modeled in the base cases.

Total units and qualifying capacity available in this area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB- AREA NAME	NQC Comments	CAISO Tag
ALMEGT_1_UNIT 1	38118	ALMDACT1	13.8	23.80	1	Oakland		MUNI
ALMEGT_1_UNIT 2	38119	ALMDACT2	13.8	24.40	1	Oakland		MUNI
BANKPP_2_NSPIN	38760	DELTA E	13.2	28.00	10	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38760	DELTA E	13.2	28.00	11	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38765	DELTA D	13.2	28.00	8	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38765	DELTA D	13.2	28.00	9	Contra Costa	Pumps	MUNI

BANKPP_2_NSPIN	38770	DELTA C	13.2	28.00	6	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38770	DELTA C	13.2	28.00	7	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38815	DELTA B	13.2	28.00	4	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38815	DELTA B	13.2	28.00	5	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38820	DELTA A	13.2	9.00	1	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38820	DELTA A	13.2	9.00	2	Contra Costa	Pumps	MUNI
BANKPP_2_NSPIN	38820	DELTA A	13.2	22.00	3	Contra Costa	Pumps	MUNI
BLHVN_7_MENLOP				1.06		None	Not modeled Aug NQC	QF/Selfgen
BRDSLD_2_HIWIND	32172	HIGHWINDS	34.5	35.09	1	Contra Costa	Aug NQC	Wind
BRDSLD_2_MTZUMA	32171	HIGHWIND3	34.5	5.95	1	Contra Costa	Aug NQC	Wind
BRDSLD_2_SHILO1	32176	SHILOH	34.5	36.85	1	Contra Costa	Aug NQC	Wind
BRDSLD_2_SHILO2	32177	SHILOH 2	34.5	33.87	1	Contra Costa	Aug NQC	Wind
CALPIN_1_AGNEW	35860	OLS-AGNE	9.11	22.43	1	San Jose	Aug NQC	QF/Selfgen
CARDCG_1_UNITS	33463	CARDINAL	12.5	10.67	1	None	Aug NQC	QF/Selfgen
CARDCG_1_UNITS	33463	CARDINAL	12.5	10.68	2	None	Aug NQC	QF/Selfgen
CLRMKT_1_QF				0.00		Oakland	Not modeled	QF/Selfgen
COCOPP_7_UNIT 6	33116	C.COS 6	18	0.00	1	Contra Costa	Energy Only	Market
COCOPP_7_UNIT 7	33117	C.COS 7	18	0.00	1	Contra Costa	Energy Only	Market
CONTAN_1_UNIT	36856	CCA100	13.8	25.80	1	San Jose	Aug NQC	QF/Selfgen
CROKET_7_UNIT	32900	CRCKTCOG	18	194.00	1	Pittsburg	Aug NQC	QF/Selfgen
CSCCOG_1_UNIT 1	36854	Cogen	12	3.00	1	San Jose		MUNI
CSCCOG_1_UNIT 1	36854	Cogen	12	3.00	2	San Jose		MUNI
CSCGNR_1_UNIT 1	36858	Gia100	13.8	24.00	1	San Jose		MUNI
CSCGNR_1_UNIT 2	36895	Gia200	13.8	24.00	2	San Jose		MUNI
DELTA_2_PL1X4	33107	DEC STG1	24	269.61	1	Pittsburg	Aug NQC	Market
DELTA_2_PL1X4	33108	DEC CTG1	18	181.13	1	Pittsburg	Aug NQC	Market
DELTA_2_PL1X4	33109	DEC CTG2	18	181.13	1	Pittsburg	Aug NQC	Market
DELTA_2_PL1X4	33110	DEC CTG3	18	181.13	1	Pittsburg	Aug NQC	Market
DUANE_1_PL1X3	36863	DVRaGT1	13.8	49.27	1	San Jose		MUNI
DUANE_1_PL1X3	36864	DVRbGT2	13.8	49.27	1	San Jose		MUNI
DUANE_1_PL1X3	36865	DVRaST3	13.8	49.26	1	San Jose		MUNI
FLOWD1_6_ALTPP1	35318	FLOWDPTR	9.11	0.00	1	Contra Costa	Aug NQC	Wind
FLOWD2_2_UNIT 1				2.86		Contra Costa	Not Modeled Aug NQC	Wind
GATWAY_2_PL1X3	33118	GATEWAY1	18	189.27	1	Contra Costa	Aug NQC	Market
GATWAY_2_PL1X3	33119	GATEWAY2	18	185.36	1	Contra Costa	Aug NQC	Market
GATWAY_2_PL1X3	33120	GATEWAY3	18	185.36	1	Contra Costa	Aug NQC	Market
GILROY_1_UNIT	35850	GLRY COG	13.8	69.30	1	Llagas	Aug NQC	Market
GILROY_1_UNIT	35850	GLRY COG	13.8	35.70	2	Llagas	Aug NQC	Market
GILRPP_1_PL1X2	35851	GROYPKR1	13.8	45.50	1	Llagas	Aug NQC	Market
GILRPP_1_PL1X2	35852	GROYPKR2	13.8	45.50	1	Llagas	Aug NQC	Market
GILRPP_1_PL3X4	35853	GROYPKR3	13.8	46.00	1	Llagas	Aug NQC	Market
GRZZLY_1_BERKLY	32740	HILLSIDE	115	24.58	1	None	Aug NQC	QF/Selfgen
GWFPW1_6_UNIT	33131	GWF #1	9.11	15.73	1	Pittsburg, Contra Costa	Aug NQC	QF/Selfgen
GWFPW2_1_UNIT 1	33132	GWF #2	13.8	17.53	1	Pittsburg	Aug NQC	QF/Selfgen
GWFPW3_1_UNIT 1	33133	GWF #3	13.8	14.53	1	Pittsburg, Contra Costa	Aug NQC	QF/Selfgen
GWFPW4_6_UNIT 1	33134	GWF #4	13.8	16.51	1	Pittsburg, Contra Costa	Aug NQC	QF/Selfgen
GWFPW5_6_UNIT 1	33135	GWF #5	13.8	17.54	1	Pittsburg	Aug NQC	QF/Selfgen
HICKS_7_GUADLP				1.98		None	Not modeled Aug	QF/Selfgen

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STOILS_1_UNITS	32121	CHEVGEN1	13.8	1.41	1	Pittsburg	Aug NQC	QF/Selfgen
STOILS_1_UNITS	32922	CHEVGEN2	13.8	1.41	1	Pittsburg	Aug NQC	QF/Selfgen
TIDWTR_2_UNITS	33151	FOSTER W	12.5	5.93	1	Pittsburg	Aug NQC	QF/Selfgen
TIDWTR_2_UNITS	33151	FOSTER W	12.5	5.93	2	Pittsburg	Aug NQC	QF/Selfgen
TIDWTR_2_UNITS	33151	FOSTER W	12.5	5.93	3	Pittsburg	Aug NQC	QF/Selfgen
UNCHEM_1_UNIT	32920	UNION CH	9.11	15.94	1	Pittsburg	Aug NQC	QF/Selfgen
UNOCAL_1_UNITS	32910	UNOCAL	12	0.03	1	Pittsburg	Aug NQC	QF/Selfgen
UNOCAL_1_UNITS	32910	UNOCAL	12	0.03	2	Pittsburg	Aug NQC	QF/Selfgen
UNOCAL_1_UNITS	32910	UNOCAL	12	0.03	3	Pittsburg	Aug NQC	QF/Selfgen
UNTDOF_7_UNITS	33466	UNTDO CO	9.11	22.81	1	None	Aug NQC	QF/Selfgen
USWINDR_2_SMUD	32169	SOLANOWP	21	17.82	1	Contra Costa	Aug NQC	Wind
USWINDR_2_UNITS	32168	EXNCO	9.11	26.27	1	Contra Costa	Aug NQC	Wind
USWPFK_6_FRICK	35320	USW FRIC	12	0.47	1	Contra Costa	Aug NQC	Wind
USWPFK_6_FRICK	35320	USW FRIC	12	0.47	2	Contra Costa	Aug NQC	Wind
USWPJR_2_UNITS	33838	USWP_#3	9.11	2.57	1	Contra Costa	Aug NQC	Wind
WINDMAS_2_UNIT1	33170	WINDMSTR	9.11	3.30	1	Contra Costa	Aug NQC	Wind
ZOND_6_UNIT	35616	ZOND SYS	9.11	4.50	1	Contra Costa	Aug NQC	Wind
IBMCCTL_1_UNIT1	35637	IBM-CTLE	115	0.00	1	San Jose	No NQC - hist. data	Market
IMHOFF_1_UNIT1	33136	CCCSO	12.5	4.40	1	Pittsburg	No NQC - hist. data	QF/Selfgen
SHELRF_1_UNITS	33141	SHELL 1	12.5	20.00	1	Pittsburg	No NQC - hist. data	QF/Selfgen
SHELRF_1_UNITS	33142	SHELL 2	12.5	40.00	1	Pittsburg	No NQC - hist. data	QF/Selfgen
SHELRF_1_UNITS	33143	SHELL 3	12.5	40.00	1	Pittsburg	No NQC - hist. data	QF/Selfgen
ZANKER_1_UNIT1	35861	SJ-SCL W	9.11	5.00	1	San Jose	No NQC - hist. data	QF/Selfgen
BRDSLD_2_MTZUM2	32179	MNTZUMA2	0.69	26	1	Contra Costa	No NQC - est. data	Wind
BRDSLD_2_SHLO3A	32191	SHLH3AC2	0.58	30	1	Contra Costa	No NQC - est. data	Wind
BRDSLD_2_SHLO3B	32194	SHLH3BC2	0.58	30	1	Contra Costa	No NQC - est. data	Wind
KELSO_2_GTG6	33813	KELSOCT1	13.8	50	1	Contra Costa	No NQC - Pmax	Market
KELSO_2_GTG7	33815	KELSOCT2	13.8	50	2	Contra Costa	No NQC - Pmax	Market
KELSO_3_GTG8	33817	KELSOCT3	13.8	50	3	Contra Costa	No NQC - Pmax	Market
KELSO_3_GTG9	33819	KELSOCT4	13.8	50	4	Contra Costa	No NQC - Pmax	Market
New Unit	32186	SOLANO	34.5	42	1	Contra Costa	No NQC - est. data	Wind
New Unit	33188	T320BS1	16.4	193.5	1	Contra Costa	No NQC - Pmax	Market
New Unit	33188	T320BS1	16.4	193.5	2	Contra Costa	No NQC - Pmax	Market
New Unit	33189	T320BS2	16.4	193.5	3	Contra Costa	No NQC - Pmax	Market
New Unit	33189	T320BS2	16.4	193.5	4	Contra Costa	No NQC - Pmax	Market
New Unit	35304	Q045CTG1	15	177.50	1	None	No NQC - Pmax	Market
New Unit	35305	Q045CTG2	15	177.50	1	None	No NQC - Pmax	Market
New Unit	35306	Q067ST81	15	245.00	1	None	No NQC - Pmax	Market
New Unit	35858	T0387ST1	13.8	120.00	1	San Jose	No NQC - Pmax	Market

1. Replace Moraga 230/115kV Bank #1 with larger unit - 12/30/2012

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2. Eastshore - San Mateo 230 kV Line Reconductor – 12/01/2011
3. Eastshore - Dumbarton 115 kV Line Reconductor - 06/01/2012
4. Four Wind farms connected to Birds Landing (~ 340 MW P max)
5. Russell City Energy Center (~ 600 MW P max) - 06/01/2013
6. Marsh Landing Generating Station (~ 774 MW P max) - 12/01/2012
7. Los Esteros Critical Energy Facility (LECEF) capacity increase by 120 MW (total 295 MW) - 05/01/2013

### Critical Contingency Analysis Summary

#### **Oakland Sub-area**

The most critical contingency is an outage of the C-X #2 and #3 115 kV cables. The area limitation is thermal overloading of the D-L 115 kV lines. This limiting contingency establishes a LCR of 68 MW in 2012 (includes 49 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

This Oakland requirement does not include the need for Pittsburg/Oakland sub-area.

#### **Effectiveness factors:**

All units within this area have the same effectiveness factor. Units outside of this area are not effective.

#### **Llagas Sub-area**

The most critical contingency is an outage between Metcalf D and Morgan Hill 115 kV (with one of the Gilroy Peaker off-line). The area limitation is thermal overloading of the Metcalf-Llagas 115 kV line as well as voltage drop (5%) at the Morgan Hill substation.

As documented within a CAISO Operating Procedure, this limitation is dependent on power flowing in the direction from Metcalf to Llagas/Morgan Hill. This limiting contingency establishes a LCR of 100 MW in 2013 (includes 0 MW of QF and Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

#### **Effectiveness factors:**

All units within this area have the same effectiveness factor. Units outside of this area are not effective.

#### **San Jose Sub-area**

The most critical contingency is an outage of Metcalf-EI Patio #1 or #2 115 kV line followed by Metcalf-Evergreen #1 115 kV line. The area limitation is thermal overloading of the Evergreen – San Jose B 115 kV line. This limiting contingency establishes a LCR of 565 MW in 2013 (includes 53 MW of QF and 202 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency is an outage of the Metcalf-Evergreen #1 115 kV line with Duane PP out of service. The sub-area area limitation is thermal overloading of the Northern Receiving Station (NRS) - Southern Receiving Station (SRS) 115 kV. This limiting contingency establishes a LCR of 354 MW in 2013 (including 53 MW of QF and 202 MW of Muni generation).

#### **Effectiveness factors:**

The following table has units within the Bay Area that are at least 5% effective to the above-mentioned most critical constraint.

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
35863	CATALYST	1	20
36856	CCCA100	1	6
36854	Cogen	1	6
36854	Cogen	2	6
36863	DVRaGT1	1	6
36864	DVRbGT2	1	6
36865	DVRaST3	1	6
35860	OLS-AGNE	1	5
36858	Gia100	1	5
36859	Gia200	2	5
35854	LECEFGT1	1	5
35855	LECEFGT2	2	5
35856	LECEFGT3	3	5
35857	LECEFGT4	4	5

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### ***Pittsburg and Oakland Sub-area Combined***

The most critical contingency is an outage of the Moraga #3 230/115 kV transformer combined with the loss of Delta Energy Center. The sub-area area limitation is thermal overloading of Moraga #1 230/115 kV transformer. This limiting contingency establishes a LCR of 2379 MW in 2013 (including 417 MW of QF and 49 MW of Muni generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency is an outage of the Moraga #3 230/115 kV transformer. The sub-area area limitation is thermal overloading of the Moraga #1 230/115 kV transformer. This limiting contingency establishes a LCR of 1966 MW in 2013 (including 417 MW of QF and 49 MW of Muni generation).

#### **Effectiveness factors:**

Please see Bay Area overall.

### ***Contra Costa Sub-area***

The most critical contingency is an outage of Kelso-Tesla 230 kV with the Gateway off line. The area limitation is thermal overloading of the Delta Switching Yard-Tesla 230 kV line. This limiting contingency establishes a LCR of 1052 MW in 2013 (includes 47 MW of QF and 298 MW of Wind generation and 264 MW of MUNI pumps) as the minimum capacity necessary for reliable load serving capability within this sub-area.

#### **Effectiveness factors:**

The following table has units within the Bay Area that are at least 10% effective to the above-mentioned constraint.

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
33175	ALTAMONT	1	83
38760	DELTA E	10	71
38760	DELTA E	11	71
38765	DELTA D	8	71
38765	DELTA D	9	71
38770	DELTA C	6	71

38770	DELTA C	7	71
38815	DELTA B	4	71
38815	DELTA B	5	71
38820	DELTA A	3	71
33170	WINDMSTR	1	68
33118	GATEWAY1	1	23
33119	GATEWAY2	1	23
33120	GATEWAY3	1	23
33116	C.COS 6	1	23
33117	C.COS 7	1	23
33133	GWF #3	1	23
33134	GWF #4	1	23
33178	RVEC_GEN	1	23
33131	GWF #1	1	22
32179	T222	1	18
32188	P0611G	1	18
32190	Q039	1	18
32186	P0609	1	18
32171	HIGHWND3	1	18
32177	Q0024	1	18
32168	ENXCO	2	18
32169	SOLANOWP	1	18
32172	HIGHWNDS	1	18
32176	SHILOH	1	18
33838	USWP_#3	1	18
32173	LAMBGT1	1	14
32174	GOOSEHGT	2	14
32175	CREEDGT1	3	14
35312	SEAWESTF	1	11
35316	ZOND SYS	1	11
35320	USW FRIC	1	11

### ***Bay Area overall***

As the aggregate sub pocket LCR is not adequate to cover the overall Bay area contingency,

The most critical contingency is an overlapping outage of the Tesla-Metcalf 500 kV line and Tesla-Newark #1 230 kV line. The sub-area area limitation is thermal overload on the Tesla-Ravenswood 230 kV line. This limiting contingency establishes a LCR of 4502 MW in 2013 (including 549 MW of QF, 519 MW of MUNI and 300 MW of wind generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

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The most critical single contingency is an outage of the Tesla-Metcalf 500 kV line with Delta Energy Center out of service. The sub-area area limitation is reactive margin within the Bay Area. This limiting contingency establishes a LCR of 3479 MW in 2013 (including 549 MW of QF, 519 MW of MUNI and 300 MW of wind generation).

**Effectiveness factors:**

For most helpful procurement information please read procedure T-133Z effectiveness factors (posted under M-2210Z) at: <http://www.aiso.com/Documents/2210Z.pdf>

**Changes compared to last year's results:**

Overall the load forecast went up by 279 MW. There are many new resources and transmission projects modeled compared with last year study. As an overall result, LCR has increased by 224 MW.

**Bay Area Overall Requirements:**

2013	Wind (MW)	QF/Selfgen (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	300	549	519	6296	7664

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>18</sup>	3479	0	3479
Category C (Multiple) <sup>19</sup>	4502	0	4502

<sup>18</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>19</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

**6. Greater Fresno Area**

**Area Definition**

The transmission facilities coming into the Greater Fresno area are:

- 1) Gates-Gregg 230 kV Line
- 2) Gates-McCall 230 kV Line
- 3) Gates #1 230/70 kV Transformer Bank
- 4) Los Banos #3 230/70 kV Transformer Bank
- 5) Los Banos #4 230/70 kV Transformer Bank
- 6) Panoche-Helm 230 kV Line
- 7) Panoche-Kearney 230 kV Line
- 8) Panoche #1 230/115 kV Transformer
- 9) Panoche #2 230/115 kV Transformer
- 10) Warnerville-Wilson 230 kV Line
- 11) Wilson-Melones 230 kV Line
- 12) Smyrna-Corcoran 115kV Line
- 13) Coalinga #1-San Miguel 70 kV Line

The substations that delineate the Greater Fresno area are:

- 1) Gates is out Henrietta is in
- 2) Gates is out Henrietta is in
- 3) Gates 230 kV is out Gates 70 kV is in
- 4) Los Banos 230 kV is out Los Banos 70 kV is in
- 5) Los Banos 230 kV is out Los Banos 70 kV is in
- 6) Panoche is out Helm is in
- 7) Panoche is out Mc Mullin is in
- 8) Panoche 115 kV is in Panoche 230 kV is out
- 9) Panoche 115 kV is in Panoche 230 kV is out
- 10) Warnerville is out Wilson is in
- 11) Wilson is in Melones is out
- 12) Quebec SP is out Corcoran is in
- 13) Coalinga is in San Miguel is out

2013 total busload within the defined area is 3032 MW with 81 MW of losses resulting in a total (load plus losses) of 3032 MW.

Total units and qualifying capacity available in this area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB-AREA NAME	NQC Comments	CAISO Tag
AGRIC0_6_PL3N5	34608	AGRIC0	13.8	20.00	3	Wilson, Herndon		Market
AGRIC0_7_UNIT	34608	AGRIC0	13.8	43.05	2	Wilson, Herndon		Market
AGRIC0_7_UNIT	34608	AGRIC0	13.8	7.45	4	Wilson, Herndon		Market
BALCHS_7_UNIT 1	34624	BALCH	13.2	33.00	1	Wilson, Herndon	Aug NQC	Market

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BALCHS_7_UNIT 2	34612	BLCH	13.8	52.50	1	Wilson, Herndon	Aug NQC	Market
BALCHS_7_UNIT 3	34614	BLCH	13.8	52.50	1	Wilson, Herndon	Aug NQC	Market
BORDEN_2_QF	34253	BORDEN D	12.5	0.98	QF	Wilson	Aug NQC	QF/Selfgen
BULLRD_7_SAGNES	34213	BULLD 12	12.5	0.00	1	Wilson	Aug NQC	QF/Selfgen
CAPMAD_1_UNIT 1	34179	MADERA_G	13.8	17.00	1	Wilson	Market	
CHEVCO_6_UNIT 1	34652	CHV.COAL	9.11	6.69	1	Wilson	Aug NQC	QF/Selfgen
CHEVCO_6_UNIT 2	34652	CHV.COAL	9.11	1.40	2	Wilson	Aug NQC	QF/Selfgen
CHWCHL_1_BIOMAS	34305	CHWCHLA2	13.8	3.84	1	Wilson, Herndon	Aug NQC	Market
CHWCHL_1_UNIT	34301	CHOWCOGN	13.8	48.00	1	Wilson, Herndon	Market	
COLGA1_6_SHELLW	34654	COLNGAGN	9.11	35.61	1	Wilson	Aug NQC	QF/Selfgen
CRESSY_1_PARKER	34140	CRESSEY	115	1.24		Wilson	Not modeled Aug NQC	MUNI
CRNEVL_6_CRNVA	34634	CRANEVLY	12	0.71	1	Wilson	Aug NQC	Market
CRNEVL_6_SJQN 2	34631	SJ2GEN	9.11	3.20	1	Wilson	Aug NQC	Market
CRNEVL_6_SJQN 3	34633	SJ3GEN	9.11	4.20	1	Wilson	Aug NQC	Market
DINUBA_6_UNIT	34648	DINUBA E	13.8	9.87	1	Wilson, Herndon	Market	
ELNIDP_6_BIOMAS	34330	ELNIDO	13.8	3.16	1	Wilson	Aug NQC	Market
EXCHEC_7_UNIT 1	34306	EXCHQUER	13.8	61.77	1	Wilson	Aug NQC	MUNI
FRIANT_6_UNITS	34636	FRIANTDM	6.6	8.71	2	Wilson	Aug NQC	QF/Selfgen
FRIANT_6_UNITS	34636	FRIANTDM	6.6	4.65	3	Wilson	Aug NQC	QF/Selfgen
FRIANT_6_UNITS	34636	FRIANTDM	6.6	1.23	4	Wilson	Aug NQC	QF/Selfgen
GATES_6_PL1X2	34553	WHD_GAT2	13.8	46.00	1	Wilson	NQC List has 0 MW	Market
GWFPWR_1_UNITS	34431	GWFP_HEP1	13.8	42.20	1	Wilson, Herndon		Market
GWFPWR_1_UNITS	34433	GWFP_HEP2	13.8	42.20	1	Wilson, Herndon		Market
HAASPH_7_PL1X2	34610	HAAS	13.8	68.15	1	Wilson, Herndon	Aug NQC	Market
HAASPH_7_PL1X2	34610	HAAS	13.8	68.15	2	Wilson, Herndon	Aug NQC	Market
HELMGP_7_UNIT 1	34600	HELMS	18	404.00	1	Wilson	Aug NQC	Market
HELMGP_7_UNIT 2	34602	HELMS	18	404.00	2	Wilson	Aug NQC	Market
HELMGP_7_UNIT 3	34604	HELMS	18	404.00	3	Wilson	Aug NQC	Market
HENRTA_6_UNITA1	34539	GWFP_GT1	13.8	45.33	1	Wilson, Henrietta	Market	
HENRTA_6_UNITA2	34541	GWFP_GT2	13.8	45.23	1	Wilson, Henrietta	Market	
INTTRB_6_UNIT	34342	INT.TURB	9.11	2.50	1	Wilson	Aug NQC	QF/Selfgen
JRWOOD_1_UNIT 1	34332	JRWCOGEN	9.11	1.70	1	Wilson	Aug NQC	QF/Selfgen
KERKH1_7_UNIT 1	34344	KERCKHOF	6.6	13.00	1	Wilson, Herndon	Aug NQC	Market
KERKH1_7_UNIT 2	34344	KERCKHOF	6.6	8.50	2	Wilson, Herndon	Aug NQC	Market
KERKH1_7_UNIT 3	34344	KERCKHOF	6.6	12.80	3	Wilson, Herndon	Aug NQC	Market
KERKH2_7_UNIT 1	34308	KERCKHOF	13.8	153.90	1	Wilson, Herndon	Aug NQC	Market
KINGCO_1_KINGBR	34642	KINGSBUR	9.11	22.97	1	Wilson, Herndon	Aug NQC	QF/Selfgen
KINGRV_7_UNIT 1	34616	KINGSRIV	13.8	51.20	1	Wilson, Herndon	Aug NQC	Market
MALAGA_1_PL1X2	34671	KRCDPCT1	13.8	48.00	1	Wilson, Herndon	Market	
MALAGA_1_PL1X2	34672	KRCDPCT2	13.8	48.00	1	Wilson, Herndon	Market	
MCCALL_1_QF	34219	MCCALL 4	12.5	0.64	QF	Wilson, Herndon	Aug NQC	QF/Selfgen
MCSWAIN_6_UNITS	34320	MCSWAIN	9.11	5.22	1	Wilson	Aug NQC	MUNI
MENBIO_6_UNIT	34334	BIO PWR	9.11	20.67	1	Wilson	Aug NQC	QF/Selfgen
MERCFL_6_UNIT	34322	MERCEDFL	9.11	2.30	1	Wilson	Aug NQC	Market
PINFLT_7_UNITS	38720	PINEFLAT	13.8	27.50	1	Wilson, Herndon	Aug NQC	MUNI
PINFLT_7_UNITS	38720	PINEFLAT	13.8	27.50	2	Wilson, Herndon	Aug NQC	MUNI
PINFLT_7_UNITS	38720	PINEFLAT	13.8	27.50	3	Wilson, Herndon	Aug NQC	MUNI
PNCHPP_1_PL1X2	34328	STARGT1	13.8	55.58	1	Wilson	Market	
PNCHPP_1_PL1X2	34329	STARGT2	13.8	55.58	1	Wilson	Market	
PNOCHE_1_PL1X2	34142	WHD_PAN2	13.8	45.00	1	Wilson, Herndon	Market	

PNOCHE_1_UNITA1	34186	DG_PAN1	13.8	42.78	1	Wilson		Market
SGREGY_6_SANGER	34646	SANGERCO	9.11	26.47	1	Wilson	Aug NQC	QF/Selfgen
STOREY_7_MDRCHW	34209	STOREY D	12.5	1.18	1	Wilson	Aug NQC	QF/Selfgen
ULTPFR_1_UNIT 1	34640	ULTR.PWR	9.11	18.31	1	Wilson, Herndon	Aug NQC	QF/Selfgen
WISHON_6_UNITS	34658	WISHON	2.3	4.51	1	Wilson	Aug NQC	Market
WISHON_6_UNITS	34658	WISHON	2.3	4.51	2	Wilson	Aug NQC	Market
WISHON_6_UNITS	34658	WISHON	2.3	4.51	3	Wilson	Aug NQC	Market
WISHON_6_UNITS	34658	WISHON	2.3	4.51	4	Wilson	Aug NQC	Market
WISHON_6_UNITS	34658	WISHON	2.3	0.36	5	Wilson	Aug NQC	Market
WRGHTP_7_AMENGY	24207	WRIGHT D	12.5	0.52	QF	Wilson	Aug NQC	QF/Selfgen
NA	34257	SANCTY D	12	0.00	1	Wilson	No NQC - hist. data	QF/Selfgen
NA	34263	SANDDRAG	12	0.00	1	Wilson	No NQC - hist. data	QF/Selfgen
NA	34265	AVENAL P	12	0.00	1	Wilson	No NQC - hist. data	QF/Selfgen
NA	34485	FRESNOWW	12.5	4.00	1	Wilson	No NQC - hist. data	QF/Selfgen
NA	34485	FRESNOWW	12.5	4.00	2	Wilson	No NQC - hist. data	QF/Selfgen
NA	34485	FRESNOWW	12.5	1.00	3	Wilson	No NQC - hist. data	QF/Selfgen
ONLPP_6_UNIT 1	34316	ONEILPMP	9.11	0.50	1	Wilson	No NQC - hist. data	MUNI
GWFPWR_6_UNIT	34650	GWFP-PWR	9.11	0.00	1	Wilson, Henrietta	Retired	QF/Selfgen
MENBIO_6_RENEW1	34339	CALRENEW	12.5	0.00	1	Wilson	Energy Only	Market
New Unit	34603	JOBSWLT	12.5	0.00	ST	Wilson	Energy Only	Market
New Unit	34673	Q372	0.48	20.00	1	Wilson, Henrietta	No NQC - Pmax	Market
New Unit	34674	Q470	0.48	20.00	1	Wilson, Henrietta	No NQC - Pmax	Market
New Unit	34675	Q471	0.48	20.00	1	Wilson, Henrietta	No NQC - Pmax	Market
New Unit	34696	Q478	21	20.00	1	Wilson, Herndon	No NQC - Pmax	Market

**Major new projects modeled:**

1. A few new small resources we added.

**Critical Contingency Analysis Summary**

**Wilson Sub-area**

The Wilson sub-area largely defines the Fresno area import constraints. The main constrained spot is located at Warnerville-Wilson-Gregg 230 kV transmission corridor. Other constrained spots are located at the Gates-McCall, Gates-Gregg, Panoche-McCall and Panoche-Gregg 230 kV transmission corridors.

The most critical contingency is the loss of the Melones - Wilson 230 kV line overlapped

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with one of the Helms units out of service. This contingency would thermally overload the Warnerville - Wilson 230 kV line (most stringent) and possibly also the Gates-McCall 230 kV line. This limiting contingency establishes a LCR of 1786 MW in 2013 (includes 163 MW of QF and 151 MW of Muni generation) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The following table has units within Fresno that are at least 5% effective to the constraint on the Warnerville – Wilson 230 kV line.

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
34332	JRWCOGEN	1	40%
34330	ELNIDO	1	37%
34209	STOREY D	1	35%
34322	MERCEDFL	1	35%
34320	MCSWAIN	1	34%
34306	EXCHQUER	1	34%
34305	CHWCHLA2	1	32%
34301	CHOWCOGN	1	32%
34253	BORDEN D	1	28%
34658	WISHON	1	28%
34658	WISHON	1	28%
34658	WISHON	1	28%
34658	WISHON	1	28%
34658	WISHON	1	28%
34631	SJ2GEN	1	28%
34633	SJ3GEN	1	27%
34636	FRIANTDM	2	27%
34636	FRIANTDM	3	27%
34636	FRIANTDM	4	27%
34600	HELMS 1	1	27%
34602	HELMS 2	1	27%
34604	HELMS 3	1	27%
34308	KERCKHOF	1	26%
34344	KERCKHOF	1	26%
34344	KERCKHOF	2	26%
34344	KERCKHOF	3	26%
34485	FRESNOWW	1	24%
34648	DINUBA E	1	22%
34179	MADERA_G	1	22%
34616	KINGSRIV	1	22%
34624	BALCH 1	1	21%
34671	KRCDPCT1	1	21%
34672	KRCDPCT2	1	21%
34640	ULTR.PWR	1	21%
34646	SANGERCO	1	21%
34642	KINGSBUR	1	19%

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34696	Q478	1	18%
34610	HAAS	1	18%
34610	HAAS	1	18%
34614	BLCH 2-3	1	18%
34612	BLCH 2-2	1	17%
38720	PINE FLT	1	17%
38720	PINE FLT	2	17%
38720	PINE FLT	3	17%
34431	GWFF_HEP1	1	17%
34433	GWFF_HEP2	1	17%
34334	BIO PWR	1	14%
34673	Q372	1	13%
34674	Q470	1	13%
34675	Q471	1	13%
34608	AGRICO	2	13%
34608	AGRICO	3	13%
34608	AGRICO	4	13%
34539	GWFF_GT1	1	13%
34541	GWFF_GT2	1	13%
34650	GWFF-PWR.	1	13%
34186	DG_PAN1	1	11%
34142	WHD_PAN2	1	11%
34652	CHV.COAL	1	10%
34652	CHV.COAL	2	10%
34553	WHD_GAT2	1	9%
34654	COLNGAGN	1	9%
34342	INT.TURB	1	6%
34316	ONEILPMP	1	6%

**Herndon Sub-area**

The most critical contingency is the loss of the Helm -McCall 230 kV line along with Gates-McCall 230 kV line. This contingency could thermally overload the Herndon–Manchester 115 kV line. This limiting contingency establishes a LCR of 372 MW (includes 42 MW of QF and 83 MW of Muni generation) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The following table has units within Fresno area that are relatively effective to the above-mentioned constraint.

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
34648	DINUBA E	1	32%
34616	KINGSRIV	1	31%
34671	KRCDPCT1	1	31%
34672	KRCDPCT2	1	31%
34624	BALCH 1	1	31%

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34640	ULTR.PWR	1	30%
34646	SANGERCO	1	30%
34618	MCCALL1T	1	30%
34610	HAAS	1	30%
34614	BLCH 2-3	1	30%
34612	BLCH 2-2	1	29%
38720	PINE FLT	3	29%
38720	PINE FLT	2	29%
38720	PINE FLT	1	29%
34696	Q478	1	29%
34642	KINGSBUR	1	28%
34344	KERCKHOF	3	20%
34344	KERCKHOF	2	20%
34344	KERCKHOF	1	20%
34308	KERCKHOF	1	19%
34433	GW_FHEP2	1	15%
34431	GW_FHEP1	1	15%

**Henrietta Sub-area**

Henrietta 230/70 bank # 2 which was identified as the limiting element in the previous LCR analysis has been taken out of service and is available as spare for the outage of the 230/70 bank # 4. This eliminates the LCR requirement for the Henrietta area.

**Changes compared to last year's results:**

From 2012 the load forecast has decreased by 88 MW and the LCR needs by 121 MW.

**Fresno Area Overall Requirements:**

2013	QF/Selfgen (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	163	151	2503	2817

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>20</sup>	1786	0	1786
Category C (Multiple) <sup>21</sup>	1786	0	1786

<sup>20</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>21</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

**7. Kern Area**

**Area Definition**

The transmission facilities coming into the Kern PP sub-area are:

- 1) Wheeler Ridge-Lamont 115 kV line
- 2) Kern PP 230/115 kV Bank # 3
- 3) Kern PP 230/115 kV Bank # 4
- 4) Kern PP 230/115 kV Bank # 5
- 5) Midway 230/115 Bank # 1
- 6) Midway 230/115 Bank # 2
- 7) Midway 230/115 Bank #3
- 8) Temblor – San Luis Obispo 115 kV line

The substations that delineate the Kern-PP sub-area are:

- 1) Wheeler Ridge is out Lamont is in
- 2) Kern PP 230 kV is out Kern PP 115 kV is in
- 3) Kern PP 230 kV is out Kern PP 115 kV is in
- 4) Kern PP 230 kV is out Kern PP 115 kV is in
- 5) Midway 230 kV is out Midway 115 kV is in
- 6) Midway 230 kV is out Midway 115 kV is in
- 7) Midway 230 kV is out Midway 115 kV is in
- 8) Temblor is in San Luis Obispo is out

2013 total busload within the defined area: 1295 MW with 16 MW of losses resulting in a total (load plus losses) of 1311 MW.

Total units and qualifying capacity available in this Kern area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB-AREA NAME	NQC Comments	CAISO Tag
BDGRCK_1_UNITS	35029	BADGERCK	9.11	43.40	1	Kern PP	Aug NQC	QF/Selfgen
BEARMT_1_UNIT	35066	PSE-BEAR	9.11	45.90	1	Kern PP, West Park	Aug NQC	QF/Selfgen
CHALK_1_UNIT	35038	CHLKCLF+	9.11	44.76	1	Kern PP	Aug NQC	QF/Selfgen
CHEVCD_6_UNIT	35052	CHEVUSA	9.11	2.16	1	Kern PP	Aug NQC	QF/Selfgen
CHEVCY_1_UNIT	35032	CHV-CYMR	9.11	5.04	1	Kern PP	Aug NQC	QF/Selfgen
DEXZEL_1_UNIT	35024	DEXEL +	9.11	28.45	1	Kern PP	Aug NQC	QF/Selfgen
DISCOV_1_CHEVRN	35062	DISCOVERY	9.11	2.44	1	Kern PP	Aug NQC	QF/Selfgen
DOUBLC_1_UNITS	35023	DOUBLE C	9.11	37.50	1	Kern PP	Aug NQC	QF/Selfgen
FELLOW_7_QFUNTS	34778	FELLOWS	21	1.34	QF	Kern PP	Aug NQC	QF/Selfgen
FRITO_1_LAY	35048	FRITOLAY	9.11	0.09	1	Kern PP	Aug NQC	QF/Selfgen
KERNFT_1_UNITS	35026	KERNFRNT	9.11	37.70	1	Kern PP	Aug NQC	QF/Selfgen
KERNRG_1_UNITS	35040	KERNRDGE	9.11	0.54	1	Kern PP	Aug NQC	QF/Selfgen
KERNRG_1_UNITS	35040	KERNRDGE	9.11	0.54	2	Kern PP	Aug NQC	QF/Selfgen
LIVOK_1_UNIT 1	35058	PSE-LVOK	9.11	44.27	1	Kern PP	Aug NQC	QF/Selfgen
MIDSET_1_UNIT 1	35044	TX MIDST	9.11	32.82	1	Kern PP	Aug NQC	QF/Selfgen
MIDWAY_1_QF	34215	MIDWY D7	12.5	0.03	QF	Kern PP	Aug NQC	QF/Selfgen
MKTRCK_1_UNIT 1	35060	PSEMCKIT	9.11	40.01	1	Kern PP	Aug NQC	QF/Selfgen

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MTNPOS_1_UNIT	35036	MT POSO	9.11	34.60	1	Kern PP	Aug NQC	QF/Selfgen
OILDAL_1_UNIT 1	35028	OILDALE	9.11	38.96	1	Kern PP	Aug NQC	QF/Selfgen
SIERRA_1_UNITS	35027	HISIERRA	9.11	43.26	1	Kern PP	Aug NQC	QF/Selfgen
TANHIL_6_SOLART	35050	SLR-TANN	9.11	10.18	1	Kern PP	Aug NQC	QF/Selfgen
TEMBLR_7_WELLPT	34201	TEMBLORD	12.5	0.26	WP	Kern PP	Aug NQC	QF/Selfgen
TXMCKT_6_UNIT				4.04		Kern PP	Not modeled Aug NQC	QF/Selfgen
ULTOGL_1_POSO	35035	ULTR PWR	9.11	34.73	1	Kern PP	Aug NQC	QF/Selfgen
UNVRSY_1_UNIT 1	35037	UNIVRSTY	9.11	32.23	1	Kern PP	Aug NQC	QF/Selfgen
VEDDER_1_SEKERN	35046	SEKR	9.11	6.10	1	Kern PP	Aug NQC	QF/Selfgen
MIDSUN_1_PL1X2	35034	MIDSUN +	9.11	0.00	1	Kern PP	Retired Market	
NA	34783	TEXCO_NM	9.11	0.00	1	Kern PP	No NQC - hist. data	QF/Selfgen
NA	34783	TEXCO_NM	9.11	3.40	2	Kern PP	No NQC - hist. data	QF/Selfgen
NA	35056	TX-LOSTH	4.16	8.80	1	Kern PP	No NQC - hist. data	QF/Selfgen
New Unit	35000	Q340	21	0.00	1	Kern PP	Energy Only	Market

**Major new projects modeled:**

1. Transfer Navy 35 load and self-gen to the Midway-Elk Hills 230 kV lines.

**Critical Contingency Analysis Summary**

***Kern PP Sub-area***

The most critical contingency is the outage of the Kern PP #5 or #3 230/115 kV transformer followed by the Kern PP – Double C Junction 115 kV line, which could thermally overload the parallel Kern PP #4 230/115 kV transformer. This limiting contingency establishes a LCR of 483 MW in 2013 (includes 584 MW of QF generation) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency is the loss of Kern PP #5 or #3 230/115 kV transformer bank, which could thermally overload the parallel Kern PP #4 230/115 kV transformer. This limiting contingency establishes a LCR of 295 MW in 2013 (includes 584 MW of QF generation).

**Effectiveness factors:**

The following table shows units that are at least 5% effective:

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
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35066	PSE-BEAR	1	22%
35029	BADGERCK	1	22%
35023	DOUBLE C	1	22%
35027	HISIERRA	1	22%
35026	KERNFRNT	1	21%
35058	PSE-LVOK	1	21%
35028	OILDALE	1	21%
35062	DISCOVERY	1	21%
35046	SEKR	1	21%
35024	DEXEL +	1	21%
35036	MT POSO	1	15%
35035	ULTR PWR	1	15%
35052	CHEV.USA	1	6%

**Weedpatch Sub-area**

Weedpatch sub-area has been eliminated from this year's LCR analysis. Circuit breaker (CB) 42 at San Bernard substation which was normally closed for earlier year's analysis was open for this year's analysis. This results in a system configuration that by design drops the load in the area for the most critical contingency reported in previous analysis.

**West Park Sub-area**

The most critical contingency is the loss of common mode Kern - West Park # 1 & #2 115 kV lines, resulting in the overload of the 6/42 To Magunden section of Kern – Magunden - Witco 115 kV line. This limitation establishes a LCR of 115 MW (includes 46 MW of QF generation and 42 MW of deficiency) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

All units within this sub-area are needed therefore no effectiveness factor is required.

**Changes compared to last year's results:**

From 2012 the load forecast has increased by 201 MW and the LCR by 200 MW.

**Kern Area Overall Requirements:**

2013	QF/Selfgen (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	584	0	584

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2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>22</sup>	295	0	295
Category C (Multiple) <sup>23</sup>	483	42	525

8. LA Basin Area

Area Definition

The transmission tie lines into the LA Basin Area are:

- 1) San Onofre - San Luis Rey #1, #2, & #3 230 kV Lines
- 2) San Onofre - Talega #1 & #2 230 kV Lines
- 3) Lugo - Mira Loma #2 & #3 500 kV Lines
- 4) Lugo - Rancho Vista #1 500 kV line
- 5) Sylmar - Eagle Rock 230 kV Line
- 6) Sylmar - Gould 230 kV Line
- 7) Vincent - Mesa Cal 230 kV Line
- 8) Vincent - Rio Hondo #1 & #2 230 kV Lines
- 9) Eagle Rock - Pardee 230 kV Line
- 10) Devers - Palo Verde 500 kV Line
- 11) Mirage - Coachelv 230 kV Line
- 12) Mirage - Ramon 230 kV Line
- 13) Mirage - Julian Hinds 230 kV Line

These sub-stations form the boundary surrounding the LA Basin area:

- 1) San Onofre is in San Luis Rey is out
- 2) San Onofre is in Talega is out
- 3) Mira Loma is in Lugo is out
- 4) Rancho Vista is in Lugo is out
- 5) Eagle Rock is in Sylmar is out
- 6) Gould is in Sylmar is out
- 7) Mesa Cal is in Vincent is out
- 8) Rio Hondo is in Vincent is out
- 9) Eagle Rock is in Pardee is out
- 10) Devers is in Palo Verde is out
- 11) Mirage is in Coachelv is out

<sup>22</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>23</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

- 12) Mirage is in Ramon is out
- 13) Mirage is in Julian Hinds is out

Total 2013 busload within the defined area is 19,300 MW with 133 MW of losses and 27 MW pumps resulting in total load + losses + pumps of 19,460 MW.

Total units and qualifying capacity available in the LA Basin area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB-AREA NAME	NQC Comments	CAISO Tag
ALAMIT_7_UNIT 1	24001	ALAMT1 G	18	174.56	1	Western		Market
ALAMIT_7_UNIT 2	24002	ALAMT2 G	18	175.00	2	Western		Market
ALAMIT_7_UNIT 3	24003	ALAMT3 G	18	332.18	3	Western		Market
ALAMIT_7_UNIT 4	24004	ALAMT4 G	18	335.67	4	Western		Market
ALAMIT_7_UNIT 5	24005	ALAMT5 G	20	497.97	5	Western		Market
ALAMIT_7_UNIT 6	24161	ALAMT6 G	20	495.00	6	Western		Market
ANAHM_2_CANYN1	25211	CanyonGT	13.8	49.40	1	Western		MUNI
ANAHM_2_CANYN2	25212	CanyonGT	13.8	48.00	2	Western		MUNI
ANAHM_2_CANYN3	25213	CanyonGT	13.8	48.00	3	Western		MUNI
ANAHM_2_CANYN4	25214	CanyonGT	13.8	49.40	4	Western		MUNI
ANAHM_7_CT	25203	ANAHEIMG	13.8	40.64	1	Western	Aug NQC	MUNI
ARCOGN_2_UNITS	24011	ARCO_1G	13.8	54.28	1	Western	Aug NQC	QF/Selfgen
ARCOGN_2_UNITS	24012	ARCO_2G	13.8	54.28	2	Western	Aug NQC	QF/Selfgen
ARCOGN_2_UNITS	24013	ARCO_3G	13.8	54.28	3	Western	Aug NQC	QF/Selfgen
ARCOGN_2_UNITS	24014	ARCO_4G	13.8	54.28	4	Western	Aug NQC	QF/Selfgen
ARCOGN_2_UNITS	24163	ARCO_5G	13.8	27.14	5	Western	Aug NQC	QF/Selfgen
ARCOGN_2_UNITS	24164	ARCO_6G	13.8	27.15	6	Western	Aug NQC	QF/Selfgen
BARRE_2_QF	24016	BARRE	230	0.00		Western	Not modeled	QF/Selfgen
BARRE_6_PEAKER	29309	BARPKGEN	13.8	45.38	1	Western		Market
BRDWAY_7_UNIT 3	29007	BRODWYSC	13.8	65.00	1	Western		MUNI
BUCKWD_7_WINTCV	25634	BUCKWIND	115	0.15	W5	None	Aug NQC	Wind
CABZON_1_WINDA1	29290	CABAZON	33	11.29	1	None	Aug NQC	Wind
CENTER_2_QF	24203	CENTER S	66	18.10		Western	Not modeled	QF/Selfgen
CENTER_2_RHONDO	24203	CENTER S	66	1.91		Western	Not modeled	QF/Selfgen
CENTER_6_PEAKER	29308	CTRPKGEN	13.8	44.57	1	Western		Market
CENTRY_6_PL1X4	25302	CLTNCTRY	13.8	36.00	1	None	Aug NQC	MUNI
CHEVMN_2_UNITS	24022	CHEVGEN1	13.8	0.00	1	Western, El Nido	Aug NQC	QF/Selfgen
CHEVMN_2_UNITS	24023	CHEVGEN2	13.8	0.00	2	Western, El Nido	Aug NQC	QF/Selfgen
CHINO_2_QF	24024	CHINO	66	7.83		Western	Not modeled	QF/Selfgen
CHINO_2_SOLAR	24024	CHINO	66	0.00		Western	Not modeled	Market
CHINO_6_CIMGEN	24026	CIMGEN	13.8	25.29	1	Western	Aug NQC	QF/Selfgen
CHINO_6_SMPAP	24140	SIMPSON	13.8	27.15	1	Western	Aug NQC	QF/Selfgen
CHINO_7_MILIKN	24024	CHINO	66	1.37		Western	Not modeled	Market
COLTON_6_AGUAM1	25303	CLTNAGUA	13.8	43.00	1	None		MUNI
CORONS_6_CLRWTR	24210	MIRALOMA	66	14.00		None	Not modeled	MUNI
CORONS_6_CLRWTR	24210	MIRALOMA	66	14.00		None	Not modeled	MUNI
DEVERS_1_QF	24815	GARNET	115	1.51	QF	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25632	TERAWND	115	2.94	QF	None	Aug NQC	QF/Selfgen

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DEVERS_1_QF	25633	CAPWIND	115	0.56	QF	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25634	BUCKWIND	115	1.73	QF	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25635	ALTWIND	115	1.35	Q1	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25635	ALTWIND	115	2.50	Q2	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25636	RENWIND	115	0.59	Q1	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25636	RENWIND	115	2.28	Q2	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25636	RENWIND	115	0.27	W1	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25637	TRANWIND	115	6.68	QF	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25639	SEAWIND	115	2.01	QF	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25640	PANAERO	115	1.79	QF	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25645	VENWIND	115	1.53	EU	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25645	VENWIND	115	3.58	Q1	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25645	VENWIND	115	2.41	Q2	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25646	SANWIND	115	0.80	Q1	None	Aug NQC	QF/Selfgen
DEVERS_1_QF	25646	SANWIND	115	2.68	Q2	None	Aug NQC	QF/Selfgen
DMDVLY_1_UNITS	25425	ESRP P2	6.9	1.39		None	Not modeled Aug NQC	QF/Selfgen
DREWS_6_PL1X4	25301	CLTNDREW	13.8	36.00	1	None	Aug NQC	MUNI
DVLCYN_1_UNITS	25603	DVLCYN3G	13.8	67.15	3	None	Aug NQC	MUNI
DVLCYN_1_UNITS	25604	DVLCYN4G	13.8	67.15	4	None	Aug NQC	MUNI
DVLCYN_1_UNITS	25648	DVLCYN1G	13.8	50.35	1	None	Aug NQC	MUNI
DVLCYN_1_UNITS	25649	DVLCYN2G	13.8	50.35	2	None	Aug NQC	MUNI
ELLIS_2_QF	24197	ELLIS	66	0.00		Western, Ellis	Not modeled Aug NQC	QF/Selfgen
ELSEGN_7_UNIT 3	24047	ELSEG3 G	18	335.00	3	Western, El Nido		Market
ELSEGN_7_UNIT 4	24048	ELSEG4 G	18	335.00	4	Western, El Nido		Market
ETIWND_2_FONTNA	24055	ETIWANDA	66	0.81		None	Not modeled Aug NQC	QF/Selfgen
ETIWND_2_QF	24055	ETIWANDA	66	14.86		None	Not modeled Aug NQC	QF/Selfgen
ETIWND_2_SOLAR	24055	ETIWANDA	66	0.00		None	Not modeled Aug NQC	Market
ETIWND_6_GRPLND	29305	ETWPKGEN	13.8	42.53	1	None		Market
ETIWND_6_MWDET1	25422	ETI MWDG	13.8	10.37	1	None	Aug NQC	Market
ETIWND_7_MDVLY	24055	ETIWANDA	66	1.54		None	Not modeled Aug NQC	QF/Selfgen
ETIWND_7_UNIT 3	24052	MTNVIST3	18	320.00	3	None		Market
ETIWND_7_UNIT 4	24053	MTNVIST4	18	320.00	4	None		Market
GARNET_1_UNITS	24815	GARNET	115	0.71	G1	None	Aug NQC	QF/Selfgen
GARNET_1_UNITS	24815	GARNET	115	0.25	G2	None	Aug NQC	QF/Selfgen
GARNET_1_UNITS	24815	GARNET	115	0.51	G3	None	Aug NQC	QF/Selfgen
GARNET_1_UNITS	24815	GARNET	115	0.25	PC	None	Aug NQC	QF/Selfgen
GARNET_1_WIND	24815	GARNET	115	0.66	W2	None	Aug NQC	Wind
GARNET_1_WIND	24815	GARNET	115	0.66	W3	None	Aug NQC	Wind
GLNARM_7_UNIT 1	29005	PASADNA1	13.8	22.30	1	Western		MUNI
GLNARM_7_UNIT 2	29006	PASADNA2	13.8	22.30	1	Western		MUNI
GLNARM_7_UNIT 3	29005	PASADNA1	13.8	44.83		Western	Not modeled	MUNI
GLNARM_7_UNIT 4	29006	PASADNA2	13.8	42.42		Western	Not modeled	MUNI
HARBGN_7_UNITS	24062	HARBOR G	13.8	76.28	1	Western		Market
HARBGN_7_UNITS	24062	HARBOR G	13.8	11.86	HP	Western		Market
HARBGN_7_UNITS	25510	HARBORG4	4.16	11.86	LP	Western		Market
HINSON_6_CARBGN	24020	CARBOGEN	13.8	21.46	1	Western	Aug NQC	Market

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HINSON_6_LBECH1	24078	LBEACH1G	13.8	65.00	1	Western		Market
HINSON_6_LBECH2	24170	LBEACH2G	13.8	65.00	2	Western		Market
HINSON_6_LBECH3	24171	LBEACH3G	13.8	65.00	3	Western		Market
HINSON_6_LBECH4	24172	LBEACH4G	13.8	65.00	4	Western		Market
HINSON_6_SERRGN	24139	SERRFGEN	13.8	28.38	1	Western	Aug NQC	QF/Selfgen
HNTGBH_7_UNIT 1	24066	HUNT1 G	13.8	225.75	1	Western, Ellis		Market
HNTGBH_7_UNIT 2	24067	HUNT2 G	13.8	225.80	2	Western, Ellis		Market
INDIGO_1_UNIT 1	29190	WINTCEX2	13.8	42.00	1	None		Market
INDIGO_1_UNIT 2	29191	WINTCEX1	13.8	42.00	1	None		Market
INDIGO_1_UNIT 3	29180	WINTCE8	13.8	42.00	1	None		Market
INLDEM_5_UNIT 1	29041	IEEC-G1	19.5	335.00	1	Valley	Aug NQC	Market
INLDEM_5_UNIT 2	29042	IEEC-G2	19.5	335.00	1	Valley	Aug NQC	Market
JOHANN_6_QFA1	24072	JOHANNA	230	0.00		Western, Ellis	Not modeled Aug NQC	QF/Selfgen
LACIEN_2_VENICE	24337	VENICE	13.8	4.45	1	Western, El Nido	Aug NQC	MUNI
LAFRES_6_QF	24073	LA FRESA	66	2.55		Western, El Nido	Not modeled Aug NQC	QF/Selfgen
LAGBEL_6_QF	24075	LAGUBELL	66	10.60		Western	Not modeled Aug NQC	QF/Selfgen
LGHTHP_6_ICEGEN	24070	ICEGEN	13.8	46.55	1	Western	Aug NQC	QF/Selfgen
LGHTHP_6_QF	24083	LITEHIPE	66	1.10		Western	Not modeled Aug NQC	QF/Selfgen
MESAS_2_QF	24209	MESA CAL	66	1.06		Western	Not modeled Aug NQC	QF/Selfgen
MIRLOM_2_CORONA				2.35		None	Not modeled Aug NQC	QF/Selfgen
MIRLOM_2_TEMESC				2.49		None	Not modeled Aug NQC	QF/Selfgen
MIRLOM_6_DELGEN	24030	DELGEN	13.8	29.78	1	None	Aug NQC	QF/Selfgen
MIRLOM_6_PEAKER	29307	MRLPKGEN	13.8	43.18	1	None		Market
MIRLOM_7_MWDLKM	24210	MIRALOMA	66	4.60		None	Not modeled Aug NQC	MUNI
MOJAVE_1_SIPHON	25657	MJVSPHN1	13.8	6.00	1	None	Aug NQC	Market
MOJAVE_1_SIPHON	25657	MJVSPHN1	13.8	6.00	2	None	Aug NQC	Market
MOJAVE_1_SIPHON	25657	MJVSPHN1	13.8	6.00	3	None	Aug NQC	Market
MTWIND_1_UNIT 1	29060	MOUNTWIND	115	7.08	S1	None	Aug NQC	Wind
MTWIND_1_UNIT 2	29060	MOUNTWIND	115	2.76	S2	None	Aug NQC	Wind
MTWIND_1_UNIT 3	29060	MOUNTWIND	115	2.88	S3	None	Aug NQC	Wind
OLINDA_2_COYCRK	24211	OLINDA	66	3.13		Western	Not modeled	QF/Selfgen
OLINDA_2_QF	24211	OLINDA	66	0.78	1	Western	Aug NQC	QF/Selfgen
OLINDA_7_LNDFIL	24201	BARRE	66	4.50		Western	Not modeled Aug NQC	QF/Selfgen
PADUA_2_ONTARO	24111	PADUA	66	0.91		None	Not modeled Aug NQC	QF/Selfgen
PADUA_6_MWDSM	24111	PADUA	66	7.70		None	Not modeled Aug NQC	MUNI
PADUA_6_QF	24111	PADUA	66	0.74		None	Not modeled Aug NQC	QF/Selfgen
PADUA_7_SDIMAS	24111	PADUA	66	1.05		None	Not modeled Aug NQC	QF/Selfgen
PWEST_1_UNIT				0.15		Western	Not modeled Aug NQC	Market
REDOND_7_UNIT 5	24121	REDON5 G	18	178.87	5	Western		Market
REDOND_7_UNIT 6	24122	REDON6 G	18	175.00	6	Western		Market
REDOND_7_UNIT 7	24123	REDON7 G	20	505.96	7	Western		Market

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REDOND_7_UNIT 8	24124	REDON8 G	20	495.90	8	Western		Market
RHONDO_2_QF	24213	RIOHONDO	66	2.54		Western	Not modeled Aug NQC	QF/Selfgen
RHONDO_6_PUENTE	24213	RIOHONDO	66	0.00		Western	Not modeled Aug NQC	Market
RVSIDE_2_RERCU3	24299	RERC2G3	13.8	48.50	1	None		MUNI
RVSIDE_2_RERCU4	24300	RERC2G4	13.8	48.50	1	None		MUNI
RVSIDE_6_RERCU1	24242	RERC1G	13.8	48.35	1	None		MUNI
RVSIDE_6_RERCU2	24243	RERC2G	13.8	48.50	1	None		MUNI
RVSIDE_6_SPRING	24244	SPRINGEN	13.8	36.00	1	None		Market
SANTGO_6_COYOTE	24133	SANTIAGO	66	6.08	1	Western, Ellis	Aug NQC	Market
SBERDO_2_PSP3	24921	MNTV-CT1	18	129.71	1	None		Market
SBERDO_2_PSP3	24922	MNTV-CT2	18	129.71	1	None		Market
SBERDO_2_PSP3	24923	MNTV-ST1	18	225.08	1	None		Market
SBERDO_2_PSP4	24924	MNTV-CT3	18	129.71	1	None		Market
SBERDO_2_PSP4	24925	MNTV-CT4	18	129.71	1	None		Market
SBERDO_2_PSP4	24926	MNTV-ST2	18	225.08	1	None		Market
SBERDO_2_QF	24214	SANBRDNO	66	0.14		None	Not modeled Aug NQC	QF/Selfgen
SBERDO_2_SNTANA	24214	SANBRDNO	66	0.27		None	Not modeled Aug NQC	QF/Selfgen
SBERDO_6_MILLCK	24214	SANBRDNO	66	1.28		None	Not modeled Aug NQC	QF/Selfgen
SONGS_7_UNIT 2	24129	S.ONOFR2	22	1122.00	2	Western		Nuclear
SONGS_7_UNIT 3	24130	S.ONOFR3	22	1124.00	3	Western		Nuclear
TIFFNY_1_DILLON				5.63		Western	Not modeled Aug NQC	Wind
VALLEY_5_PERRIS	24160	VALLEYSC	115	7.94		Valley	Not modeled Aug NQC	QF/Selfgen
VALLEY_5_REDMTN	24160	VALLEYSC	115	2.00		Valley	Not modeled Aug NQC	QF/Selfgen
VALLEY_7_BADLND	24160	VALLEYSC	115	0.54		Valley	Not modeled Aug NQC	Market
VALLEY_7_UNITA1	24160	VALLEYSC	115	1.34		Valley	Not modeled Aug NQC	Market
VERNON_6_GONZL1				5.75		Western	Not modeled	MUNI
VERNON_6_GONZL2				5.75		Western	Not modeled	MUNI
VERNON_6_MALBRG	24239	MALBRG1G	13.8	42.37	C1	Western		MUNI
VERNON_6_MALBRG	24240	MALBRG2G	13.8	42.37	C2	Western		MUNI
VERNON_6_MALBRG	24241	MALBRG3G	13.8	49.26	S3	Western		MUNI
VILLPK_2_VALLVY	24216	VILLA PK	66	4.10		Western	Not modeled Aug NQC	QF/Selfgen
VILLPK_6_MWDYOR	24216	VILLA PK	66	0.00		Western	Not modeled Aug NQC	MUNI
VISTA_6_QF	24902	VSTA	66	0.17	1	None	Aug NQC	QF/Selfgen
WALNUT_6_HILLGEN	24063	HILLGEN	13.8	47.07	1	Western	Aug NQC	QF/Selfgen
WALNUT_7_WCOVCT	24157	WALNUT	66	3.43		Western	Not modeled Aug NQC	Market
WALNUT_7_WCOVST	24157	WALNUT	66	2.98		Western	Not modeled Aug NQC	Market
WHTWTR_1_WINDA1	29061	WHITEWTR	33	8.26	1	None	Aug NQC	Wind
ARCOGN_2_UNITS	24018	BRIGEN	13.8	0.00	1	Western	No NQC - hist. data	Market
HINSON_6_QF	24064	HINSON	66	0.00	1	Western	No NQC - hist. data	QF/Selfgen
INLAND_6_UNIT	24071	INLAND	13.8	30.30	1	None	No NQC -	QF/Selfgen

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MOBGEN_6_UNIT 1	24094	MOBGEN	13.8	20.20	1	Western, El Nido	hist. data	QF/Selfgen
NA	24324	SANIGEN	13.8	6.80	D1	None	No NQC - hist. data	QF/Selfgen
NA	24325	ORCOGEN	13.8	0.00	1	Western, Ellis	No NQC - hist. data	QF/Selfgen
NA	24327	THUMSGEN	13.8	40.00	1	Western	No NQC - hist. data	QF/Selfgen
NA	24328	CARBGEN2	13.8	15.2	1	Western	No NQC - hist. data	Market
NA	24329	MOBGEN2	13.8	20.2	1	Western, El Nido	No NQC - hist. data	QF/Selfgen
NA	24330	OUTFALL1	13.8	0.00	1	Western, El Nido	No NQC - hist. data	QF/Selfgen
NA	24331	OUTFALL2	13.8	0.00	1	Western, El Nido	No NQC - hist. data	QF/Selfgen
NA	24332	PALOGEN	13.8	3.60	D1	Western, El Nido	No NQC - hist. data	QF/Selfgen
NA	24341	COYGEN	13.8	0.00	1	Western, Ellis	No NQC - hist. data	QF/Selfgen
NA	24342	FEDGEN	13.8	0.00	1	Western	No NQC - hist. data	QF/Selfgen
NA	24839	BLAST	115	45.00	1	None	No NQC - hist. data	QF/Selfgen
NA	29021	WINTEC6	115	45.00	1	None	No NQC - hist. data	Wind
NA	29023	WINTEC4	12	16.50	1	None	No NQC - hist. data	Wind
NA	29060	SEAWEST	115	44.40	S1	None	No NQC - hist. data	Wind
NA	29060	SEAWEST	115	22.20	S2	None	No NQC - hist. data	Wind
NA	29060	SEAWEST	115	22.40	S3	None	No NQC - hist. data	Wind
NA	29260	ALTAMSA4	115	40.00	1	None	No NQC - hist. data	Wind
NA	29338	CLEARGEN	13.8	0.00	1	None	No NQC - hist. data	QF/Selfgen
NA	29339	DELGEN	13.8	0.00	1	None	No NQC - hist. data	QF/Selfgen
NA	29951	REFUSE	13.8	9.90	D1	Western	No NQC - Pmax	QF/Selfgen
NA	29953	SIGGEN	13.8	24.90	D1	Western	No NQC - Pmax	QF/Selfgen
HNTGBH_7_UNIT 3	24167	HUNT3 G	13.8	0.00	3	Western, Ellis	Retired	Market
HNTGBH_7_UNIT 4	24168	HUNT4 G	13.8	0.00	4	Western, Ellis	Retired	Market
New unit	29201	EME WCG1	13.8	100	1	Western	No NQC - Pmax	Market
New unit	29202	EME WCG2	13.8	100	1	Western	No NQC - Pmax	Market
New unit	29203	EME WCG3	13.8	100	1	Western	No NQC - Pmax	Market
New unit	29204	EME WCG4	13.8	100	1	Western	No NQC - Pmax	Market
New unit	29205	EME WCG5	13.8	100	1	Western	No NQC - Pmax	Market
New unit	29901	NRG ELG5	18	175	5	Western, El Nido	No NQC - Pmax	Market
New unit	29902	NRG ELG7	18	280	7	Western, El Nido	No NQC -	Market

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							Pmax	
New unit	29903	NRG ELG6	18	175	6	Western, El Nido	No NQC - Pmax	Market

**Major new projects modeled:**

1. 3 new resources have been modeled
2. Huntington Beach #3 and #4 have been retired
3. Del Amo – Ellis 230 kV line loops into Barre 230 kV substation
4. Recalibrate arming level for Santiago SPS

**Critical Contingency Analysis Summary**

**LA Basin Overall:**

The most critical contingency for LA Basin is the loss of one SONGS unit followed by Palo Verde-Devers 500 kV line, which could exceed the approved 6400 MW rating for the South of Lugo path. This limiting contingency establishes a LCR of 10,295 MW in 2013 (includes 810 MW of QF, 230 MW of Wind, 1166 MW of Muni and 2246 MW of Nuclear generation) as the minimum generation capacity necessary for reliable load serving capability within this area.

**Effectiveness factors:**

The following table has units that have at least 5% effectiveness to the above-mentioned South of Lugo constraint within the LA Basin area:

Gen Bus	Gen Name	Gen ID	MW Eff Fctr (%)
24052	MTNVIST3	3	34
24053	MTNVIST4	4	34
24071	INLAND	1	32
25422	ETI MWDC	1	32
29305	ETWPKGEN	1	32
24921	MNTV-CT1	1	28
24922	MNTV-CT2	1	28
24923	MNTV-ST1	1	28
24924	MNTV-CT3	1	28
24925	MNTV-CT4	1	28
24926	MNTV-ST2	1	28
29041	IEEC-G1	1	28

29042	IEEC-G2	2	28
24905	RVCANAL1	R1	27
24906	RVCANAL2	R2	27
24907	RVCANAL3	R3	27
24908	RVCANAL4	R4	27
29190	WINTC2	1	27
29191	WINTC1	1	27
29180	WINTC8	1	27
24815	GARNET	QF	27
24815	GARNET	W3	27
29023	WINTC4	1	27
29021	WINTC6	1	27
24242	RERC1G	1	27
24243	RERC2G	1	27
24244	SPRINGEN	1	27
25301	CLTNDREW	1	27
25302	CLTNCTRY	1	27
25303	CLTNAGUA	1	27
24299	RERC2G3	1	27
24300	RERC2G4	1	27
24839	BLAST	1	27
25648	DVLCYN1G	1	26
25649	DVLCYN2G	2	26
25603	DVLCYN3G	3	26
25604	DVLCYN4G	4	26
25632	TERAWND	QF	26
25634	BUCKWND	QF	26
25635	ALTWIND	Q1	26
25635	ALTWIND	Q2	26
25637	TRANWND	QF	26
25639	SEAWIND	QF	26
25640	PANAERO	QF	26
25645	VENWIND	EU	26
25645	VENWIND	Q2	26
25645	VENWIND	Q1	26
25646	SANWIND	Q2	26
29060	MOUNTWND	S1	26
29060	MOUNTWND	S3	26
29060	MOUNTWND	S2	26
29061	WHITEWTR	1	26
29260	ALTAMSA4	1	26
29290	CABAZON	1	26
25633	CAPWIND	QF	25

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25657	MJVSPHN1	1	25
25658	MJVSPHN2	2	25
25659	MJVSPHN3	3	25
25203	ANAHEIMG	1	23
25211	CanyonGT 1	1	22
25212	CanyonGT 2	2	22
25213	CanyonGT 3	3	22
25214	CanyonGT 4	4	22
24030	DELGEN	1	21
29309	BARPKGEN	1	21
24026	CIMGEN	D1	21
24140	SIMPSON	D1	21
29307	MRLPKGEN	1	20
29338	CLEARGEN	1	20
29339	DELGEN	1	20
24005	ALAMT5 G	5	19
24066	HUNT1 G	1	19
24067	HUNT2 G	2	19
24167	HUNT3 G	3	19
24168	HUNT4 G	4	19
24129	S.ONOFR2	2	19
24130	S.ONOFR3	3	19
24133	SANTIAGO	1	19
24325	ORCOGEN	1	19
24341	COYGEN	1	19
24001	ALAMT1 G	1	18
24002	ALAMT2 G	2	18
24003	ALAMT3 G	3	18
24004	ALAMT4 G	4	18
24161	ALAMT6 G	6	18
24162	ALAMT7 G	R7	17
24063	HILLGEN	D1	17
29201	EME WCG1	1	17
29203	EME WCG3	1	17
29204	EME WCG4	1	17
29205	EME WCG5	1	17
29202	EME WCG2	1	17
24018	BRIGEN	1	16
29308	CTRPKGEN	1	16
29953	SIGGEN	D1	16
24011	ARCO 1G	1	15
24012	ARCO 2G	2	15
24013	ARCO 3G	3	15

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24014	ARCO 4G	4	15
24163	ARCO 5G	5	15
24164	ARCO 6G	6	15
24020	CARBGEN1	1	15
24022	CHEVGEN1	1	15
24023	CHEVGEN2	2	15
24064	HINSON	1	15
24070	ICEGEN	D1	15
24170	LBEACH12	2	15
24171	LBEACH34	3	15
24094	MOBGEN1	1	15
24062	HARBOR G	1	15
25510	HARBORG4	LP	15
24062	HARBOR G	HP	15
24139	SERRFGEN	D1	15
24170	LBEACH12	1	15
24171	LBEACH34	4	15
24173	LBEACH5G	R5	15
24174	LBEACH6G	R6	15
24327	THUMSGEN	1	15
24328	CARBGEN2	1	15
24330	OUTFALL1	1	15
24331	OUTFALL2	1	15
24332	PALOGEN	D1	15
24333	REDON1 G	R1	15
24334	REDON2 G	R2	15
24335	REDON3 G	R3	15
24336	REDON4 G	R4	15
24337	VENICE	1	15
24079	LBEACH7G	R7	15
24080	LBEACH8G	R8	15
24081	LBEACH9G	R9	15
24047	ELSEG3 G	3	14
24048	ELSEG4 G	4	14
24121	REDON5 G	5	14
24122	REDON6 G	6	14
24123	REDON7 G	7	14
24124	REDON8 G	8	14
24329	MOBGEN2	1	14
29901	NRG ELG5	5	14
29903	NRG ELG6	6	14
29902	NRG ELS7	7	14
29951	REFUSE	D1	13

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29209	BLY1ST1	1	13
29207	BLY1CT1	1	13
29208	BLY1CT2	1	13
24342	FEDGEN	1	13
24241	MALBRG3G	S3	12
24240	MALBRG2G	C2	12
24239	MALBRG1G	C1	12
29005	PASADNA1	1	10
29006	PASADNA2	1	10
29007	BRODWYSC	1	10

**Valley Sub-Area:**

The most critical contingency for the Valley sub-area is the loss of Palo Verde – Devers 500 kV line and Valley – Serrano 500 kV line or vice versa, which would result in voltage collapse. This limiting contingency establishes a LCR of 670 MW (includes 10 MW of QF generation) in 2013 as the generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The generators inside the sub-area have the same effectiveness factors.

**Western Sub-Area:**

The most critical contingency for the Western sub-area is the loss of Serrano-Villa Park #2 230 kV line followed by the loss of the Serrano-Lewis 230 kV line or vice versa, which would result in thermal overload of the remaining Serrano-Villa Park 230 kV line. This limiting contingency establishes a LCR of 5540 MW (includes 623 MW of QF, 6 MW of Wind, 582 MW of Muni and 2246 MW of nuclear generation) in 2013 as the generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The following table has units that have at least 5% effectiveness to the above-mentioned constraint:

Gen Bus	Gen Name	Gen ID	MW Eff Fctr (%)
29309	BARPKGEN	1	31

25203	ANAHEIMG	1	30
25211	CanyonGT 1	1	29
25212	CanyonGT 2	2	29
25213	CanyonGT 3	3	29
25214	CanyonGT 4	4	29
24005	ALAMT5 G	5	23
24161	ALAMT6 G	6	23
24001	ALAMT1 G	1	22
24002	ALAMT2 G	2	22
24003	ALAMT3 G	3	22
24004	ALAMT4 G	4	22
24162	ALAMT7 G	R7	22
24066	HUNT1 G	1	22
24067	HUNT2 G	2	22
24167	HUNT3 G	3	22
24168	HUNT4 G	4	22
24325	ORCOGEN	1	21
24133	SANTIAGO	1	16
24341	COYGEN	1	16
24011	ARCO 1G	1	15
24012	ARCO 2G	2	15
24013	ARCO 3G	3	15
24014	ARCO 4G	4	15
24018	BRIGEN	1	15
24020	CARBGEN1	1	15
24064	HINSON	1	15
24070	ICEGEN	D1	15
24170	LBEACH12	2	15
24171	LBEACH34	3	15
24062	HARBOR G	1	15
25510	HARBORG4	LP	15
24062	HARBOR G	HP	15
24139	SERRFGEN	D1	15
24170	LBEACH12	1	15
24171	LBEACH34	4	15
24173	LBEACH5G	R5	15
24174	LBEACH6G	R6	15
24327	THUMSGEN	1	15
24328	CARBGEN2	1	15
24079	LBEACH7G	R7	15
24080	LBEACH8G	R8	15
24081	LBEACH9G	R9	15
24163	ARCO 5G	5	14

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24164	ARCO 6G	6	14
24022	CHEVGEN1	1	14
24023	CHEVGEN2	2	14
24048	ELSEG4 G	4	14
24094	MOBGEN1	1	14
29308	CTRPKGEN	1	14
24329	MOBGEN2	1	14
24330	OUTFALL1	1	14
24331	OUTFALL2	1	14
24332	PALOGEN	D1	14
24333	REDON1 G	R1	14
24334	REDON2 G	R2	14
24335	REDON3 G	R3	14
24336	REDON4 G	R4	14
24337	VENICE	1	14
29953	SIGGEN	D1	14
29901	NRG ELG5	5	14
29903	NRG ELG6	6	14
29902	NRG ELS7	7	14
24047	ELSEG3 G	3	13
24121	REDON5 G	5	13
24122	REDON6 G	6	13
24123	REDON7 G	7	13
24124	REDON8 G	8	13
29951	REFUSE	D1	12
24342	FEDGEN	1	12
24241	MALBRG3G	S3	11
24240	MALBRG2G	C2	11
24239	MALBRG1G	C1	11
29005	PASADNA1	1	9
29006	PASADNA2	1	9
29007	BRODWYSC	1	9
24063	HILLGEN	D1	6
29201	EME WCG1	1	5
29203	EME WCG3	1	5
29204	EME WCG4	1	5
29205	EME WCG5	1	5
29202	EME WCG2	1	5

There are numerous (about 40) other combinations of contingencies in the area that could overload a significant number of 230 kV lines in this sub-area and have less LCR need. As such, any of them (combination of contingencies) could become binding

for any given set of procured resources. As a result, effectiveness factors may not be the best indicator towards informed procurement.

**Ellis sub-area**

The Del Amo – Ellis loop-in project along with recalibration of the Santiago SPS eliminates the LCR need for the Ellis sub-area.

**EI Nido sub-area**

The most critical contingency for the EI Nido sub-area is the loss of the La Fresa – Hinson 230 kV line followed by the loss of the La Fresa – Redondo #1 and #2 230 kV lines, which would cause voltage collapse. This limiting contingency establishes a LCR of 386 MW in 2013 (which includes 47 MW of QF and 4 MW of MUNI generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The generators inside the sub-area have the same effectiveness factors.

**Changes compared to last year's results:**

Overall the load forecast went down by 470 MW resulting in 570 MW decrease in LCR.

**LA Basin Overall Requirements:**

2013	QF/Wind (MW)	Muni (MW)	Nuclear (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	1040	1166	2246	8675	13127

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>24</sup>	10,295	0	10,295
Category C (Multiple) <sup>25</sup>	10,295	0	10,295

<sup>24</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>25</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

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9. Big Creek/Ventura Area

**Area Definition**

The transmission tie lines into the Big Creek/Ventura Area are:

- 1) Antelope #1 and #2 500/230 kV Transformers
- 2) Sylmar-Pardee #1 230 kV Line
- 3) Sylmar-Pardee #2 230 kV Line
- 4) Eagle Rock-Pardee #1 230 kV Line
- 5) Vincent-Pardee 230 kV Line
- 6) Vincent-Santa Clara 230 kV Line

These sub-stations form the boundary surrounding the Big Creek/Ventura area:

- 1) Antelope 500 kV is out Antelope 230 KV is in
- 2) Sylmar is out Pardee is in
- 3) Sylmar is out Pardee is in
- 4) Eagle Rock is out Pardee is in
- 5) Vincent is out Pardee is in
- 6) Vincent is out Santa Clara is in

Total 2013 busload within the defined area is 4164 MW with 77 MW of losses and 355

MW of pumps resulting in total load + losses + pumps of 4596 MW.

Total units and qualifying capacity available in the Big Creek/Ventura area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	KV	NQC	UNIT ID	LCR SUB- AREA NAME	NQC Comments	CAISO Tag
ALAMO_6_UNIT	25653	ALAMO SC	13.8	16.00	1	Big Creek	Aug NQC	Market
ANTLPE_2_QF	24457	ARBWIND	66	2.91	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	24458	ENCANWIND	66	15.09	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	24459	FLOWIND	66	5.45	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	24460	DUTCHWIND	66	1.87	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	24465	MORWIND	66	7.49	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	24491	OAKWIND	66	2.41	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28501	MIDWIND	12	2.41	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28502	SOUTHWIND	12	0.88	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28503	NORTHWIND	12	2.59	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28504	ZONDWIND1	12	1.76	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28505	ZONDWIND2	12	1.71	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28506	BREEZE1	12	0.60	1	Big Creek	Aug NQC	Wind
ANTLPE_2_QF	28507	BREEZE2	12	1.07	1	Big Creek	Aug NQC	Wind
BIGCRK_2_EXESWD	24306	B CRK1-1	7.2	19.38	1	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24306	B CRK1-1	7.2	21.03	2	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24307	B CRK1-2	13.8	21.03	3	Big Creek, Rector, Vestal	Aug NQC	Market

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BIGCRK_2_EXESWD	24307	B CRK1-2	13.8	30.39	4	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24308	B CRK2-1	13.8	49.48	1	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24308	B CRK2-1	13.8	50.64	2	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24309	B CRK2-2	7.2	18.22	3	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24309	B CRK2-2	7.2	19.19	4	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24310	B CRK2-3	7.2	16.55	5	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24310	B CRK2-3	7.2	18.02	6	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24311	B CRK3-1	13.8	34.09	1	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24311	B CRK3-1	13.8	34.09	2	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24312	B CRK3-2	13.8	34.09	3	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24312	B CRK3-2	13.8	39.93	4	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24313	B CRK3-3	13.8	37.99	5	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24314	B CRK 4	11.5	49.09	41	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24314	B CRK 4	11.5	49.28	42	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24315	B CRK 8	13.8	23.76	81	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24315	B CRK 8	13.8	42.85	82	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24317	MAMOTH1G	13.8	91.07	1	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24318	MAMOTH2G	13.8	91.07	2	Big Creek, Rector, Vestal	Aug NQC	Market
BIGCRK_2_EXESWD	24323	PORTAL	4.8	9.35	1	Big Creek, Rector, Vestal	Aug NQC	Market
EASTWD_7_UNIT	24319	EASTWOOD	13.8	199.00	1	Big Creek, Rector, Vestal		Market
EDMONS_2_NSPIN	25605	EDMON1AP	14.4	23.27	1	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25606	EDMON2AP	14.4	23.27	2	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25607	EDMON3AP	14.4	23.27	3	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25607	EDMON3AP	14.4	23.27	4	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25608	EDMON4AP	14.4	23.27	5	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25608	EDMON4AP	14.4	23.27	6	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25609	EDMON5AP	14.4	23.27	7	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25609	EDMON5AP	14.4	23.27	8	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25610	EDMON6AP	14.4	23.27	9	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25610	EDMON6AP	14.4	23.27	10	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25611	EDMON7AP	14.4	23.26	11	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25611	EDMON7AP	14.4	23.26	12	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25612	EDMON8AP	14.4	23.26	13	Big Creek	Pumps	MUNI
EDMONS_2_NSPIN	25612	EDMON8AP	14.4	23.26	14	Big Creek	Pumps	MUNI
GOLETA_2_QF	24057	GOLETA	66	0.14		Ventura, S.Clara, Moorpark	Not modeled Aug NQC	QF/Selfgen

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GOLETA_6_ELLWOD	28004	ELLWOOD	13.8	54.00	1	Ventura, S.Clara, Moorpark		Market
GOLETA_6_EXGEN	24057	GOLETA	66	1.17		Ventura, S.Clara, Moorpark	Not modeled Aug NQC	QF/Selfgen
GOLETA_6_GAVOTA	24057	GOLETA	66	1.41		Ventura, S.Clara, Moorpark	Not modeled Aug NQC	QF/Selfgen
GOLETA_6_TAJIGS	24057	GOLETA	66	2.90		Ventura, S.Clara, Moorpark	Not modeled Aug NQC	Market
KERRGN_1_UNIT 1	24437	KERNRVR	66	9.03	1	Big Creek	Aug NQC	Market
LEBECs_2_UNITS	28051	PSTRIAG1	18	157.90	G1	Big Creek	Aug NQC	Market
LEBECs_2_UNITS	28052	PSTRIAG2	18	157.90	G2	Big Creek	Aug NQC	Market
LEBECs_2_UNITS	28053	PSTRIAS1	18	162.40	S1	Big Creek	Aug NQC	Market
LEBECs_2_UNITS	28054	PSTRIAG3	18	157.90	G3	Big Creek	Aug NQC	Market
LEBECs_2_UNITS	28055	PSTRIAS2	18	78.90	S2	Big Creek	Aug NQC	Market
MNDALY_7_UNIT 1	24089	MANDLY1G	13.8	215.00	1	Ventura, Moorpark		Market
MNDALY_7_UNIT 2	24090	MANDLY2G	13.8	215.29	2	Ventura, Moorpark		Market
MNDALY_7_UNIT 3	24222	MANDLY3G	16	130.00	3	Ventura, S.Clara, Moorpark		Market
MONLTH_6_BOREL	24456	BOREL	66	8.98	1	Big Creek	Aug NQC	QF/Selfgen
MOORPK_2_CALABS	24099	MOORPARK	230	6.96		Ventura, Moorpark	Not modeled Aug NQC	Market
MOORPK_6_QF	24098	MOORPARK	66	26.44		Ventura, Moorpark	Not modeled Aug NQC	QF/Selfgen
MOORPK_7_UNITA1	24098	MOORPARK	66	1.24		Ventura, Moorpark	Not modeled Aug NQC	QF/Selfgen
OMAR_2_UNIT 1	24102	OMAR 1G	13.8	77.25	1	Big Creek		QF/Selfgen
OMAR_2_UNIT 2	24103	OMAR 2G	13.8	77.25	2	Big Creek		QF/Selfgen
OMAR_2_UNIT 3	24104	OMAR 3G	13.8	77.25	3	Big Creek		QF/Selfgen
OMAR_2_UNIT 4	24105	OMAR 4G	13.8	77.25	4	Big Creek		QF/Selfgen
ORMOND_7_UNIT 1	24107	ORMOND1G	26	741.27	1	Ventura, Moorpark		Market
ORMOND_7_UNIT 2	24108	ORMOND2G	26	775.00	2	Ventura, Moorpark		Market
OSO_6_NSPIN	25614	OSO A P	13.2	3.63	1	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25614	OSO A P	13.2	3.63	2	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25614	OSO A P	13.2	3.63	3	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25614	OSO A P	13.2	3.63	4	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25615	OSO B P	13.2	3.63	5	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25615	OSO B P	13.2	3.63	6	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25615	OSO B P	13.2	3.63	7	Big Creek	Pumps	MUNI
OSO_6_NSPIN	25615	OSO B P	13.2	3.63	8	Big Creek	Pumps	MUNI
PANDOL_6_UNIT	24113	PANDOL	13.8	24.81	1	Big Creek, Vestal	Aug NQC	QF/Selfgen
PANDOL_6_UNIT	24113	PANDOL	13.8	20.21	2	Big Creek, Vestal	Aug NQC	QF/Selfgen
RECTOR_2_KAWEAH	24212	RECTOR	66	1.45		Big Creek, Rector, Vestal	Not modeled Aug NQC	Market
RECTOR_2_KAWH 1	24212	RECTOR	66	0.71		Big Creek, Rector, Vestal	Not modeled Aug NQC	Market
RECTOR_2_QF	24212	RECTOR	66	5.34		Big Creek,	Not modeled	QF/Selfgen

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RECTOR_7_TULARE	24212	RECTOR	66	1.60		Big Creek, Rector, Vestal	Aug NQC	QF/Selfgen
SAUGUS_2_TOLAND	24135	SAUGUS	66	0.72		Big Creek	Not modeled Aug NQC	Market
SAUGUS_6_MWDFTH	24135	SAUGUS	66	7.50		Big Creek	Not modeled Aug NQC	MUNI
SAUGUS_6_PTCHGN	24118	PITCHGEN	13.8	19.12	1	Big Creek	Aug NQC	MUNI
SAUGUS_6_QF	24135	SAUGUS	66	0.92		Big Creek	Not modeled Aug NQC	QF/Selfgen
SAUGUS_7_CHIQCN	24135	SAUGUS	66	6.67		Big Creek	Not modeled Aug NQC	Market
SAUGUS_7_LOPEZ	24135	SAUGUS	66	5.39		Big Creek	Not modeled Aug NQC	QF/Selfgen
SNCLRA_6_OXGEN	24110	OXGEN	13.8	33.53	1	Ventura, S.Clara, Moorpark	Aug NQC	QF/Selfgen
SNCLRA_6_PROCGN	24119	PROCGEN	13.8	46.16	1	Ventura, S.Clara, Moorpark	Aug NQC	Market
SNCLRA_6_QF	24127	S.CLARA	66	1.09	1	Ventura, S.Clara, Moorpark	Aug NQC	QF/Selfgen
SNCLRA_6_WILLMT	24159	WILLAMET	13.8	12.63	1	Ventura, S.Clara, Moorpark	Aug NQC	QF/Selfgen
SPRGVL_2_QF	24215	SPRINGVL	66	0.25		Big Creek, Rector, Vestal	Not modeled Aug NQC	QF/Selfgen
SPRGVL_2_TULE	24215	SPRINGVL	66	0.63		Big Creek, Rector, Vestal	Not modeled Aug NQC	Market
SPRGVL_2_TULESC	24215	SPRINGVL	66	0.39		Big Creek, Rector, Vestal	Not modeled Aug NQC	Market
SYCAMR_2_UNITS	24143	SYCCYN1G	13.8	57.56	1	Big Creek	Aug NQC	QF/Selfgen
SYCAMR_2_UNITS	24144	SYCCYN2G	13.8	57.56	2	Big Creek	Aug NQC	QF/Selfgen
SYCAMR_2_UNITS	24145	SYCCYN3G	13.8	57.56	3	Big Creek	Aug NQC	QF/Selfgen
SYCAMR_2_UNITS	24146	SYCCYN4G	13.8	57.55	4	Big Creek	Aug NQC	QF/Selfgen
TENGEN_2_PL1X2	24148	TENNGEN1	13.8	18.35	1	Big Creek	Aug NQC	Market
TENGEN_2_PL1X2	24149	TENNGEN2	13.8	18.35	2	Big Creek	Aug NQC	Market
VESTAL_2_KERN	24152	VESTAL	66	6.72	1	Big Creek, Vestal	Aug NQC	QF/Selfgen
VESTAL_6_QF	24152	VESTAL	66	5.06		Big Creek, Vestal	Not modeled Aug NQC	QF/Selfgen
VESTAL_6_ULTRGN	24150	ULTRAGEN	13.8	34.70	1	Big Creek, Vestal	Aug NQC	QF/Selfgen
VESTAL_6_WDFIRE	28008	LAKEGEN	13.8	5.57	1	Big Creek, Vestal	Aug NQC	QF/Selfgen
WARNE_2_UNIT	25651	WARNE1	13.8	38.00	1	Big Creek	Aug NQC	Market
WARNE_2_UNIT	25652	WARNE2	13.8	38.00	1	Big Creek	Aug NQC	Market
APPGEN_6_UNIT 1	24009	APPGEN1G	13.8	0.00	1	Big Creek	No NQC - hist. data	Market
APPGEN_6_UNIT 1	24010	APPGEN2G	13.8	0.00	2	Big Creek	No NQC - hist. data	Market
MNDALY_6_MCGRTH	29306	MCGPKGEN	13.8	47.00	1	Ventura, S.Clara, Moorpark	No NQC - hist. data	Market
NA	24326	Exgen1	13.8	0.00	S1	Ventura, S.Clara, Moorpark	No NQC - hist. data	QF/Selfgen

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NA	24340	CHARMIN	13.8	15.20	1	Ventura, S.Clara, Moorpark	No NQC - hist. data	QF/Selfgen
NA	24362	Exgen2	13.8	0.00	G1	Ventura, S.Clara, Moorpark	No NQC - hist. data	QF/Selfgen
NA	24370	Kawgen	13.8	0.00	1	Big Creek, Rector, Vestal	No NQC - hist. data	Market
NA	24372	KR 3-1	13.8	0.00	1	Big Creek, Vestal	No NQC - hist. data	QF/Selfgen
NA	24373	KR 3-2	13.8	0.00	1	Big Creek, Vestal	No NQC - hist. data	QF/Selfgen
NA	24422	PALMDALE	66	0.00	1	Big Creek	No NQC - hist. data	Market
NA	24436	GOLDTOWN	66	0.00	1	Big Creek	No NQC - hist. data	Market

**Major new projects modeled:**

1. Segments of TRTP project

**Critical Contingency Analysis Summary**

***Big Creek/Ventura overall:***

The most critical contingency is the loss of the Lugo-Victorville 500 kV followed by Sylmar-Pardee #1 or #2 230 kV line, which could thermally overload the remaining Sylmar-Pardee 230 kV line. This limiting contingency establishes a LCR of 2241 MW in 2013 (includes 752 MW of QF, 381 MW of Muni and 46 MW of Wind generation) as the minimum generation capacity necessary for reliable load serving capability within this area.

The most critical single contingency is the loss of Sylmar-Pardee #1 (or #2) line followed by Ormond Beach Unit #2, which could thermally overload the remaining Sylmar-Pardee 230 kV line. This limiting contingency establishes a LCR of 2161 MW in 2013 (includes 752 MW of QF, 381 MW of Muni and 46 MW of Wind generation).

**Effectiveness factors:**

The following table has units that have at least 5% effectiveness to any one of the Sylmar-Pardee 230 kV lines after the loss of the Lugo-Victorville 500 kV followed by one of the other Sylmar-Pardee 230 kV line in this area:

Gen Bus Gen Name Gen ID MW Eff Fctr

24118	PITCHGEN	D1	35
24148	TENNGEN1	D1	35
24149	TENNGEN2	D2	35
24009	APPGEN1G	1	34
24010	APPGEN2G	2	34
24107	ORMOND1G	1	34
24108	ORMOND2G	2	34
24361	APPGEN3G	3	34
25651	WARNE1	1	33
25652	WARNE2	1	33
24090	MANDLY2G	2	32
29306	MCGPKGEN	1	32
24089	MANDLY1G	1	31
29004	ELLWOOD	1	31
29952	CAMGEN	D1	31
24326	EXGEN1	S1	31
24362	EXGEN2	G1	31
29055	PSTRIAS2	S2	30
29054	PSTRIAG3	G3	30
29053	PSTRIAS1	S1	30
29052	PSTRIAG2	G2	30
29051	PSTRIAG1	G1	30
25605	EDMON1AP	1	30
25606	EDMON2AP	2	30
25607	EDMON3AP	3	30
25607	EDMON3AP	4	30
25608	EDMON4AP	5	30
25608	EDMON4AP	6	30
25609	EDMON5AP	7	30
25609	EDMON5AP	8	30
25610	EDMON6AP	9	30
25610	EDMON6AP	10	30
25612	EDMON8AP	13	30
25612	EDMON8AP	14	30
24127	S.CLARA	1	30
24110	OXGEN	D1	30
24119	PROCGEN	D1	30
24159	WILLAMET	D1	30
24340	CHARMIN	1	30
25611	EDMON7AP	11	29
25611	EDMON7AP	12	29

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24222	MANDLY3G	3	29
25614	OSO A P	1	29
25614	OSO A P	2	29
25615	OSO B P	7	29
25615	OSO B P	8	29
25653	ALAMO SC	1	29
24370	KAWGEN	1	28
24113	PANDOL	1	27
24113	PANDOL	2	27
29008	LAKEGEN	1	27
24150	ULTRAGEN	1	27
24152	VESTAL	1	27
24372	KR 3-1	1	27
24373	KR 3-2	2	27
24102	OMAR 1G	1	26
24103	OMAR 2G	2	26
24104	OMAR 3G	3	26
24105	OMAR 4G	4	26
24143	SYCCYN1G	1	26
24144	SYCCYN2G	2	26
24145	SYCCYN3G	3	26
24146	SYCCYN4G	4	26
24319	EASTWOOD	1	25
24306	B CRK1-1	1	25
24306	B CRK1-1	2	25
24307	B CRK1-2	3	25
24307	B CRK1-2	4	25
24308	B CRK2-1	1	25
24308	B CRK2-1	2	25
24309	B CRK2-2	3	25
24309	B CRK2-2	4	25
24310	B CRK2-3	5	25
24310	B CRK2-3	6	25
24311	B CRK3-1	1	25
24311	B CRK3-1	2	25
24312	B CRK3-2	3	25
24312	B CRK3-2	4	25
24313	B CRK3-3	5	25
24314	B CRK 4	41	25
24314	B CRK 4	42	25

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24315	B CRK 8	81	25
24315	B CRK 8	82	25
24317	MAMOTH1G	1	25
24318	MAMOTH2G	2	25
24437	KERNVR	1	22
24457	ARBWIND	1	17
24465	MORWIND	1	17
24481	MIDWIND	1	17
24483	NORTHWND	1	17
24484	ZONDWIND1	1	17
24485	ZONDWIND2	1	17
24458	ENCANWIND	1	16
24459	FLOWIND	1	16
24460	DUTCHWIND	1	16
24436	GOLDTOWN	1	16
24456	BOREL	1	15

**Rector Sub-area**

The most critical contingency for the Rector sub-area is the loss of one of the Rector-Vestal 230 kV lines with the Eastwood unit out of service, which would thermally overload the remaining Rector-Vestal 230 kV line. This limiting contingency establishes a LCR of 601 MW (includes 7 MW of QF generation) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The following table has units that have at least 5% effectiveness to the above-mentioned constraint within Rector sub-area:

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
24370	KAWGEN	1	45
24319	EASTWOOD	1	41
24306	B CRK1-1	1	41
24306	B CRK1-1	2	41
24307	B CRK1-2	3	41
24307	B CRK1-2	4	41
24323	PORTAL	1	41
24308	B CRK2-1	1	40
24308	B CRK2-1	2	40
24309	B CRK2-2	3	40
24309	B CRK2-2	4	40
24315	B CRK 8	81	40
24315	B CRK 8	82	40

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24310	B CRK2-3	5	39
24310	B CRK2-3	6	39
24311	B CRK3-1	1	39
24311	B CRK3-1	2	39
24312	B CRK3-2	3	39
24312	B CRK3-2	4	39
24313	B CRK3-3	5	39
24317	MAMOTH1G	1	39
24318	MAMOTH2G	2	39
24314	B CRK 4	41	38
24314	B CRK 4	42	38

**Vestal Sub-area**

The most critical contingency for the Vestal sub-area is the loss of one of the Magunden-Vestal 230 kV lines with the Eastwood unit out of service, which would thermally overload the remaining Magunden-Vestal 230 kV line. This limiting contingency establishes a LCR of 801 MW in 2013 (which includes 104 MW of QF generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The following table has units that have at least 5% effectiveness to the above-mentioned constraint within Vestal sub-area:

Gen Bus	Gen Name	Gen ID	Eff Fctr (%)
28008	LAKEGEN	1	46
24113	PANDOL	1	45
24113	PANDOL	2	45
24150	ULTRAGEN	1	45
24372	KR 3-1	1	45
24373	KR 3-2	2	45
24152	VESTAL	1	45
24370	KAWGEN	1	45
24319	EASTWOOD	1	24
24306	B CRK1-1	1	24
24306	B CRK1-1	2	24
24307	B CRK1-2	3	24
24307	B CRK1-2	4	24
24308	B CRK2-1	1	24
24308	B CRK2-1	2	24
24309	B CRK2-2	3	24
24309	B CRK2-2	4	24
24310	B CRK2-3	5	24
24310	B CRK2-3	6	24

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24315	B CRK 8	81	24
24315	B CRK 8	82	24
24323	PORTAL	1	24
24311	B CRK3-1	1	23
24311	B CRK3-1	2	23
24312	B CRK3-2	3	23
24312	B CRK3-2	4	23
24313	B CRK3-3	5	23
24317	MAMOTH1G	1	23
24318	MAMOTH2G	2	23
24314	B CRK 4	41	22
24314	B CRK 4	42	22

**S. Clara sub-areas**

The most critical contingency for the S.Clara sub-area is the loss of the Pardee to S.Clara 230 kV line followed by the loss of the Moorpark to S.Clara #1 and #2 230 kV lines, which would cause voltage collapse. This limiting contingency establishes a LCR of 264 MW in 2013 (which includes 65 MW of QF generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The generators inside the sub-area have the same effectiveness factors.

**Moorpark sub-areas**

The most critical contingency for the Moorpark sub-area is the loss of one of the Pardee to Moorpark 230 kV lines followed by the loss of the remaining two Moorpark to Pardee 230 kV lines, which would cause voltage collapse. This limiting contingency establishes a LCR of 422 MW in 2013 (which includes 93 MW of QF generation) as the minimum capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

The generators inside the sub-area have the same effectiveness factors.

**Changes compared to last year's results:**

Overall the load forecast went down by 97 MW. The new Antelope 500/230 kV #1 and #2 transformers have been modeled as part of the TRTP. The overall effect is that the

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LCR has decreased by 852 MW. The majority of the LCR decrease is due to load allocation change within the Big Creek Ventura.

**Big Creek Overall Requirements:**

2013	QF/Wind (MW)	MUNI (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	798	381	4097	5276

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>26</sup>	2161	0	2161
Category C (Multiple) <sup>27</sup>	2241	0	2241

**10. San Diego-Imperial Valley Area**

**Area Definition**

The transmission tie lines forming a boundary around the Greater San Diego-Imperial

Valley area include:

- 1) Imperial Valley – North Gila 500 kV Line
- 2) Otay Mesa – Tijuana 230 kV Line
- 3) San Onofre - San Luis Rey #1 230 kV Line
- 4) San Onofre - San Luis Rey #2 230 kV Line
- 5) San Onofre - San Luis Rey #3 230 kV Line
- 6) San Onofre – Talega #1 230 kV Line
- 7) San Onofre – Talega #2 230 kV Line
- 8) Imperial Valley – El Centro 230 kV Line
- 9) Imperial Valley – Dixieland 230 kV Line
- 10) Imperial Valley – La Rosita 230 kV Line

The substations that delineate the Greater San Diego-Imperial Valley area are:

- 1) Imperial Valley is in North Gila is out
- 2) Otay Mesa is in Tijuana is out
- 3) San Onofre is out San Luis Rey is in

<sup>26</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>27</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

- 4) San Onofre is out San Luis Rey is in
- 5) San Onofre is out San Luis Rey is in
- 6) San Onofre is out Talega is in
- 7) San Onofre is out Talega is in
- 8) Imperial Valley is in El Centro is out
- 9) Imperial Valley is in Dixieland is out
- 10) Imperial Valley is in La Rosita is out

Total 2013 busload within the defined area: 4990 MW with 124 MW of losses resulting in total load + losses of 5114 MW.

Total units and qualifying capacity available in this area:

MKT/SCHED RESOURCE ID	BUS #	BUS NAME	kV	NQC	UNIT ID	LCR SUB-AREA NAME	NQC Comments	CAISO Tag
BORDER_6_UNITA1	22149	CALPK BD	13.8	48.98	1	San Diego		Market
CBRLLO_6_PLSTP1	22092	CABRILLO	69	2.23	1	San Diego	Aug NQC	QF/Selfgen
CCRITA_7_RPCHF	22124	CHCARITA	138	3.69	1	San Diego	Aug NQC	QF/Selfgen
CHILLS_1_SYCENG	22120	CARLTNHS	138	0.26	1	San Diego	Aug NQC	QF/Selfgen
CHILLS_7_UNITA1	22120	CARLTNHS	138	1.31	2	San Diego	Aug NQC	QF/Selfgen
CPSTNO_7_PRMAIS	22112	CAPSTRNO	138	4.73	1	San Diego	Aug NQC	QF/Selfgen
CRSTWD_6_KUMYAY	22915	KUMEYAA	34.5	6.70	1	San Diego	Aug NQC	Wind
DIVSON_6_NSQF	22172	DIVISION	69	34.41	1	San Diego	Aug NQC	QF/Selfgen
EGATE_7_NOCITY	22204	EASTGATE	69	0.21	1	San Diego	Aug NQC	QF/Selfgen
ELCAJN_6_LM6K	23320	EC GEN2	13.8	48.10	1	San Diego, El Cajon		Market
ELCAJN_6_UNITA1	22150	CALPK_EC	13.8	45.42	1	San Diego, El Cajon		Market
ELCAJN_7_GT1	22212	ELCAJNGT	12.5	16.00	1	San Diego, El Cajon		Market
ENCINA_7_EA1	22233	ENCINA 1	14.4	106.00	1	San Diego		Market
ENCINA_7_EA2	22234	ENCINA 2	14.4	104.00	1	San Diego		Market
ENCINA_7_EA3	22236	ENCINA 3	14.4	110.00	1	San Diego		Market
ENCINA_7_EA4	22240	ENCINA 4	22	300.00	1	San Diego		Market
ENCINA_7_EA5	22244	ENCINA 5	24	330.00	1	San Diego		Market
ENCINA_7_GT1	22248	ENCINAGT	12.5	14.50	1	San Diego		Market
ESCND0_6_PL1X2	22257	ESGEN	13.8	35.50	1	San Diego		Market
ESCND0_6_UNITB1	22153	CALPK ES	13.8	48.04	1	San Diego		Market
ESCO_6_GLMQF	22332	GOALLINE	69	39.92	1	San Diego, Esco	Aug NQC	QF/Selfgen
KEARNY_7_KY1	22377	KEARNGT1	12.5	16.00	1	San Diego, Mission		Market
KEARNY_7_KY2	22373	KEARN2AB	12.5	15.02	1	San Diego, Mission		Market
KEARNY_7_KY2	22373	KEARN2AB	12.5	15.02	2	San Diego, Mission		Market
KEARNY_7_KY2	22374	KEARN2CD	12.5	15.02	1	San Diego, Mission		Market
KEARNY_7_KY2	22374	KEARN2CD	12.5	13.95	2	San Diego, Mission		Market
KEARNY_7_KY3	22375	KEARN3AB	12.5	14.98	1	San Diego, Mission		Market

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KEARNY_7_KY3	22375	KEARN3AB	12.5	16.05	2	San Diego, Mission		Market
KEARNY_7_KY3	22376	KEARN3CD	12.5	14.98	1	San Diego, Mission		Market
KEARNY_7_KY3	22376	KEARN3CD	12.5	14.98	2	San Diego, Mission		Market
LAKHDG_6_UNIT1	22625	LKHODG1	13.8	20.00	1	San Diego, Bernardo		Market
LARKSP_6_UNIT1	22074	LRKSPBD1	13.8	46.00	1	San Diego		Market
LARKSP_6_UNIT2	22075	LRKSPBD2	13.8	46.00	1	San Diego		Market
LAROA1_2_UNITA1	20187	LRP-U1	16	165	1	None		Market
LAROA2_2_UNITA1	22996	INTBST	18	157	1	None		Market
LAROA2_2_UNITA1	22997	INTBCT	16	165	1	None		Market
MRGT_6_MEF2	22487	MFE_MR2	13.8	47.90	1	San Diego, Mission, Miramar		Market
MRGT_6_MMAREF	22486	MFE_MR1	13.8	48.00	1	San Diego, Mission, Miramar		Market
MRGT_7_UNITS	22488	MIRAMGT	12.5	18.55	1	San Diego, Mission, Miramar		Market
MRGT_7_UNITS	22488	MIRAMGT	12.5	17.45	2	San Diego, Mission, Miramar		Market
MSHGTS_6_MMARLF	22448	MESAHGTS	69	3.19	1	San Diego, Mission	Aug NQC	QF/Selfgen
MISSION_2_QF	22496	MISSION	69	0.74	1	San Diego	Aug NQC	QF/Selfgen
NIMTG_6_NIQF	22576	NOISLMTR	69	35.59	1	San Diego	Aug NQC	QF/Selfgen
OGROVE_6_PL1X2	22628	PA99MWQ1	13.8	49.95	1	San Diego, Pala		Market
OGROVE_6_PL1X2	22629	PA99MWQ2	13.8	49.95	2	San Diego, Pala		Market
OTAY_6_PL1X2	22617	OYGEN	13.8	35.50	1	San Diego		Market
OTAY_6_UNITB1	22604	OTAY	69	2.80	1	San Diego	Aug NQC	QF/Selfgen
OTAY_7_UNITC1	22604	OTAY	69	2.65	3	San Diego	Aug NQC	QF/Selfgen
OTMESA_2_PL1X3	22605	OTAYMGT1	18	185.06	1	San Diego		Market
OTMESA_2_PL1X3	22606	OTAYMGT2	18	185.06	1	San Diego		Market
OTMESA_2_PL1X3	22607	OTAYMST1	16	233.48	1	San Diego		Market
PALOMR_2_PL1X3	22262	PEN_CT1	18	162.39	1	San Diego		Market
PALOMR_2_PL1X3	22263	PEN_CT2	18	162.39	1	San Diego		Market
PALOMR_2_PL1X3	22265	PEN_ST	18	240.83	1	San Diego		Market
PTLOMA_6_NTCCGN	22660	POINTLMA	69	1.65	2	San Diego	Aug NQC	QF/Selfgen
PTLOMA_6_NTCQF	22660	POINTLMA	69	16.70	1	San Diego	Aug NQC	QF/Selfgen
SAMPSON_6_KELCO1	22704	SAMPSON	12.5	0.72	1	San Diego	Aug NQC	QF/Selfgen
SMRCOS_6_UNIT1	22724	SANMRCOS	69	0.47	1	San Diego	Aug NQC	QF/Selfgen
TERMEX_2_PL1X3	22981	IV GEN1	18	281	1	None		Market
TERMEX_2_PL1X3	22982	IV GEN2	18	156	1	None		Market
TERMEX_2_PL1X3	22983	IVGEN3	18	156	1	None		Market
NA	22444	MESA RIM	69	0.00	1	San Diego	No NQC - hist. data	QF/Selfgen
NA	22592	OLD TOWN	69	0.00	1	San Diego	No NQC - hist. data	QF/Selfgen
NA	22602	OMWD	69	0.00	1	San Diego	No NQC - hist. data	QF/Selfgen
NA	22708	SANLUSRY	69	0.00	1	San Diego	No NQC - hist. data	QF/Selfgen
NA	22916	PFC-AVC	0.6	0.00	1	San Diego	No NQC - hist. data	QF/Selfgen
LAKHDG_6_UNIT2	22626	LKHODG2	13.8	20.00	2	San Diego, Bernardo	No NQC - Pmax	Market

**Major new projects modeled:**

1. Sunrise Power Link Project (Southern Route)
2. Eastgate – Rose Canyon 69kV (TL6927) reconductor
3. New Imperial Valley-Dixieland 230 kV line
4. East County 500 kV substation (ECO)

**Critical Contingency Analysis Summary**

***El Cajon Sub-area:***

The most critical contingency for the El Cajon sub-area is the loss of the El Cajon-Jamacha 69 kV line (TL624) followed by the loss of Miguel-Granite-Los Coches 69 kV line (TL632), which would thermally overload the El Cajon – Los Coches 69 kV line (TL631). This limiting contingency establishes a LCR of 83 MW (including 0 MW of QF generation) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency for this sub-area is the loss of Miguel-Granite-Los Coches 69 kV line (TL632) with El Cajon Energy Center already out of service, which would thermally overload the El Cajon – Los Coches 69 kV line (TL631). This limiting contingency establishes a LCR of 53 MW (including 0 MW of QF generation) in 2013.

**Effectiveness factors:**

All units within this sub-area (El Cajon Peaker, El Cajon GT and El Cajon Energy Center) have the same effectiveness factor.

***Rose Canyon Sub-area***

This sub-area has been eliminated due to TL6927, Eastgate-Rose Canyon 69 kV reconductor which is already in-service.

***Mission Sub-area***

The most critical contingency for the Mission sub-area is the loss of Mission - Kearny 69

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kV line (TL663) followed by the loss of Mission – Mesa Heights 69kV line (TL676), which would thermally overload the Mission - Clairmont 69kV line (TL670). This limiting contingency establishes a local capacity need of 126 MW (including 3 MW of QF generation) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

Miramar Energy Facility units and Miramar GTs (Cabrillo Power II) are 8% effective, Miramar Landfill unit and all Kearny peakers are 32% effective.

**Bernardo Sub-area:**

The most critical contingency for the Bernardo sub-area is the loss of Artesian - Sycamore 69 kV line followed by the loss of Poway-Rancho Carmel 69 kV line, which would thermally overload the Felicita Tap-Bernardo 69 kV line (TL689). This limiting contingency establishes a LCR of 110 MW (including 0 MW of QF generation and 70 MW of deficiency) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

All units within this sub-area (Lake Hodges) are needed so there is no effectiveness factor required.

**Esco Sub-area**

The most critical contingency for the Esco sub-area is the loss of Poway-Pomerado 69 kV line (TL6913) followed by the loss of Esco - Escondido 69kV line (TL6908) which would thermally overload the Bernardo – Rancho Carmel 69 kV line (TL633). This limiting contingency establishes a LCR of 114 MW (including 40 MW of QF generation and 74 MW of deficiency) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

Only unit within this sub-area (Goal line) is needed so no effectiveness factor is required.

**Pala Sub-area**

The most critical contingency for the Pala sub-area is the loss of Pendleton – San Luis Rey 69 kV line (TL6912) followed by the loss of Lilac - Pala 69kV line (TL6932) which would thermally overload the Melrose – Morro Hill Tap 69 kV line. This limiting contingency establishes a LCR of 43 MW (including 0 MW of QF generation) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

**Effectiveness factors:**

All units within this sub-area (Orange Grove) have the same effectiveness factor.

**Miramar Sub-area**

The most critical contingency for the Miramar sub-area is the loss of Otay Mesa – Miguel Tap – Silvergate 230kV line (TL23042) followed by the loss of Sycamore 230/138 kV Bank #60, which would thermally overload the Sycamore - Scripps 69 kV line (TL6916). This limiting contingency establishes a LCR of 97 MW (including 0 MW of QF generation) in 2013 as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

The most critical single contingency for this sub-area is the loss of Otay Mesa – Miguel Tap – Silvergate 230kV line (TL23042) with Miramar Energy Facility #1 or #2 out of service, which would thermally overload the Sycamore - Scripps 69 kV line (TL6916). This limiting contingency establishes a LCR of 86 MW (including 0 MW of QF generation) in 2013.

**Effectiveness factors:**

All units within this sub-area (Miramar Energy Facility and Miramar GTs) have the same effectiveness factor.

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### **San Diego Sub-area:**

The most limiting contingency for San Diego sub-area is the loss of Imperial Valley-Suncrest 500 kV line followed by the loss of ECO-Miguel 500 kV line. The limiting constraint is post-transient voltage instability. This contingency establishes a LCR of 2570 MW in 2013 (includes 151 MW of QF generation and 7 MW of Wind) as the minimum generation capacity necessary for reliable load serving capability within this sub-area.

The most limiting single contingency in the San Diego sub-area is a (G-1/N-1) contingency described by the outage of ECO-Miguel 500 kV line with Otay Mesa Combined-Cycle Power Plant (603 MW) already out of service. The limiting constraint is post-transient voltage instability. This contingency establishes a LCR of 2192 MW in 2013 (includes 151 MW of QF generation and 7 MW of Wind).

### **Effectiveness factors:**

All units within this area have the same effectiveness factor. Units outside of this area are not effective.

### **San Diego Sub-area Requirements:**

2013	QF (MW)	Wind (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	151	7	2911	3069

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>28</sup>	2192	0	2192
Category C (Multiple) <sup>29</sup>	2570	144	2714

<sup>28</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>29</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

### **San Diego-Imperial Valley Area Overall:**

The most limiting contingency in the San Diego-Imperial Valley area is described by the outage of 500 kV Southwest Power Link (SWPL) between Imperial Valley and N. Gila Substations over-lapping with an outage of the Otay Mesa Combined-Cycle Power plant (603 MW) while staying within the South of San Onofre (WECC Path 44) non-simultaneous import capability rating of 2,500 MW. This limiting contingency establishes a local capacity need of 2938 MW in 2013 (includes 151 MW of QF generation and 7 MW of Wind) as the minimum capacity necessary for reliable load serving capability within this area.

It is worth mentioning that Imperial Valley – Dixieland 230kV line was modeled between IID and CAISO. There were no additional upgrades modeled between CFE and CAISO control areas at Imperial Valley 230 kV bus in 2013 base case. The CAISO acknowledges that the LCR needs for the San Diego-Imperial Valley area will decrease as additional transmission is constructed between the IID/CFE systems and Imperial Valley and more power is flowing in real-time from these control areas into the CAISO control area.

### **Effectiveness factors:**

All units within this area have the same effectiveness factor. Units outside of this area are not effective.

### **Changes compared to last year's results:**

The load forecast went up by 270 MW and total local resource capacity needed for the San Diego-Imperial Valley increased by 89 MW overall due to a combination of factors.

Local capacity needs (Category C) for the San Diego sub-area decreased by 279 MW compared to last year mainly due to the WECC classification of Sunrise Power Link and South West Power Link as not being in the same corridor as well as elimination of WECC 1000 MW path rating on Sunrise Power Link. This shifted the most restrictive constraint to the larger area, however, resulting in an overall increase of 89 MW from the

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2012 requirement but drawing on a larger pool of resources.

Overall the total LCR requirements (including deficiencies that cannot be contracted for due to unavailability of resources) have actually increased by 138 MW mainly due to the deficiency increase in the Bernardo and Esco sub-areas. It should be noted that further LCR deficiencies in the San Diego sub area are expected in later years due to the 2017 OTC compliance date for the Encina power plant and to the most restrictive contingency for this sub area limiting the pool of resources (qualifying capacity) effective in addressing the San Diego local area needs.

### ***San Diego-Imperial Valley Area Overall Requirements:***

2013	QF (MW)	Wind (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	151	7	3991	4149

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>30</sup>	2938	0	2938
Category C (Multiple) <sup>31</sup>	2938	144	3082

### ***For stakeholder information only***

#### ***Non-summer season LCR limited analysis***

These results are for information purposes only and they will not be used to alter the 2013 LSE local resource allocation. The LSE local resource allocation is done based on the summer peak study as required by the ISO Tariff.

### ***Extra assumptions as agreed upon by stakeholders:***

1. One transmission element under maintenance conditions
2. Two resources under maintenance conditions

<sup>30</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>31</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

Total 2013 busload within the defined area: 3800 MW with 71 MW of losses resulting in total load + losses of 3871 MW. This corresponds to a 1-in-10 peak for the month of October (highest among non-summer months).

### ***San Diego Sub-area non-summer season:***

Worst transmission element out on maintenance was considered to be one of the Imperial Valley-Suncrest, Imperial Valley-ECO or ECO-Miguel 500 kV lines.

The most limiting contingency for San Diego sub-area is the loss of Miguel - ECO 500 kV line with Otay Mesa out of service (Imperial Valley – Suncrest 500 kV line is out on maintenance). The limiting constraint is post-transient voltage instability. This contingency establishes a LCR of 1777 MW in 2013 (includes 151 MW of QF generation and 7 MW of Wind) as the minimum generation capacity necessary for reliable load serving capability within this sub-area in the non-summer season.

Under the current design all units with approved maintenance schedules are allowed to count towards the local requirement even when they are out of service. Maintaining these assumptions the “two units out on maintenance” can make up anywhere from 30 to 1169 MW for an average of 500-600 MW. The total local resources in the greater San Diego sub-area under an RA contract in the non-summer season should be therefore around 2277-2377 MW, a level 200-300 MW lower than the summer peak need.

### ***San Diego-Imperial Valley Area Overall non-summer season:***

Worst transmission element out on maintenance was considered to be one of the five 230 kV lines that comprise the South of SONGS path. This will reduce the import capability of South of SONGS from 2500 MW to about 1650 MW.

The most limiting contingency in the San Diego-Imperial Valley area is described by the outage of 500 kV Southwest Power Link (SWPL) between Imperial Valley and N. Gila Substations over-lapping with an outage of the Otay Mesa Combined-Cycle Power plant

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(603 MW) while staying within the South of San Onofre (WECC Path 44) non-simultaneous import capability of 1,650 MW (after one element out for maintenance). This limiting contingency establishes a local capacity need of 2498 MW in 2013 (includes 151 MW of QF generation and 7 MW of Wind) as the minimum capacity necessary for reliable load serving capability within this area in the non-summer season.

Under the current design all units with approved maintenance schedules are allowed to count towards the local requirement even when they are out of service. Maintaining these assumptions the "two units out on maintenance" can make up anywhere from 30 to 1197 MW for an average of 500-600 MW. The total local resources in the greater San Diego-Imperial Valley area under an RA contract in the non-summer season should be therefore around 2998-3098 MW, a level 200-300 MW higher than the summer peak need.

### 11. Valley Electric Area

#### Area Definition

The transmission tie lines into the area include:

- 1) Amargosa-Sandy 138 kV line
- 2) Jackass Flats-Lathrop Switch 138 kV line
- 3) Sloan Canyon-Pahrump 230 kV line
- 4) Desert View-Pahrump 230 kV line

The substations that delineate the area are:

- 1) Amargosa is out Sandy is in
- 2) Jackass Flats is out Lathrop Switch is in
- 3) Sloan Canyon is out Pahrump is in
- 4) Desert View is out Pahrump is in

Total 2013 busload within the defined area was: 119 MW along with 2 MW of transmission losses resulting in total load + losses of 121 MW.

There is no generation and qualifying capacity available in this area.

#### **Major new transmission projects modeled:**

1. Northwest-Desert View 230 kV Line #1 (under construction, be in service before the summer of 2013)

#### Critical Contingency Analysis Summary

##### **Pahrump South Sub-Area**

The most critical contingency for the Pahrump South Sub-Area is the loss of Pahrump-Gamebird 138 kV line with the biggest resource in the area out of service (estimated at a minimum of 7 MW). This contingency results in voltage lower than 0.90 pu at Gamebird sub (0.89 pu), Thousandaire sub (0.89 pu), and Charleston sub (0.89 pu), and establishes a local capacity need of 7 MW plus the biggest resource in the area (estimated at 7 MW) or a total of 14 MW (includes 14 MW of deficiency) in 2013 as the minimum capacity necessary for reliable load serving capability within this sub-area.

#### **Effectiveness factors:**

There is no generation available in this sub-area.

##### **Valley Electric Association Overall Area**

The most critical contingency for the Valley Electric Association Area is the loss of Mead-Sloan Canyon 230 kV line followed by the loss of Northwest-Desert View 230 kV line or vice versa. This double contingency event may result in voltage collapse in the Valley Electric Association area, and establishes a local capacity need of 37 MW (including 37 MW of deficiency) in 2013 as the minimum capacity necessary for reliable load serving capability within the area. An SPS to drop load for this N-2 could eliminate this overall local capacity need.

#### **Effectiveness factors:**

There is no generation available in this area.

#### **Changes compared to last year's results:**

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There is no comparison to last year's results since this is first year to establish local capacity requirement for the Valley Electric Area.

**Valley Electric Area Overall Requirements:**

2013	QF/Selfgen (MW)	Muni (MW)	Market (MW)	Max. Qualifying Capacity (MW)
Available generation	0	0	0	0

2013	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW LCR Need
Category B (Single) <sup>32</sup>	0	14	14
Category C (Multiple) <sup>33</sup>	0	37	37

<sup>32</sup> A single contingency means that the system will be able to survive the loss of a single element, however the operators will not have any means (other than load drop) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

<sup>33</sup> Multiple contingencies means that the system will be able to survive the loss of a single element, and the operators will have enough generation (other operating procedures) in order to bring the system within a safe operating zone and get prepared for the next contingency as required by NERC transmission operations standards.

**TOPIC PAPER #4**

**ELECTRIC GENERATION  
EFFICIENCY**

On July 18, 2007, The National Petroleum Council (NPC) in approving its report, *Facing the Hard Truths about Energy*, also approved the making available of certain materials used in the study process, including detailed, specific subject matter papers prepared or used by the Task Groups and their Subgroups. These Topic Papers were working documents that were part of the analyses that led to development of the summary results presented in the report's Executive Summary and Chapters.

**These Topic Papers represent the views and conclusions of the authors. The National Petroleum Council has not endorsed or approved the statements and conclusions contained in these documents but approved the publication of these materials as part of the study process.**

The NPC believes that these papers will be of interest to the readers of the report and will help them better understand the results. These materials are being made available in the interest of transparency.

The attached Topic Paper is one of 38 such working documents used in the study analyses. Also included is a roster of the Subgroup that developed or submitted this paper. Appendix E of the final NPC report provides a complete list of the 38 Topic Papers and an abstract for each. The printed final report volume contains a CD that includes pdf files of all papers. These papers also can be viewed and downloaded from the report section of the NPC website ([www.npc.org](http://www.npc.org)).

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**NATIONAL PETROLEUM COUNCIL  
POWER GENERATION EFFICIENCY SUBGROUP  
OF THE  
DEMAND TASK GROUP  
OF THE  
NPC COMMITTEE ON GLOBAL OIL AND GAS**

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### Power Plant Efficiency Outlook

#### Power Plant Efficiency

Team leader: David K. Bellman  
Date submitted: May 8, 2007

#### Executive Summary

Power plant efficiencies are typically defined as the amount of heat content in (Btu) per the amount of electric energy out (kWh), commonly called a heat rate (Btu/kWh). In the EIA and IEA outlooks both show power plant efficiencies improvements over time. These expected improvements mainly come from the substitution of old plants with new plants that have better efficiencies. The existing unit efficiency is flat. This indicates some efficiency improvement since many of the existing units will likely install environmental controls. Installation of environmental control systems will add internal energy requirements reducing the efficiency of the plant. There are a few changes one can make to make an existing unit more efficient. However these changes typically will only result in a few percentage point improvements to efficiency.

The efficiency of a new power plant is largely a function of economic choice. The technology is well understood in order to produce a highly efficient plant. In order to produce higher efficiencies, higher pressure and temperatures are required. This increases the cost of the plant as special alloy materials will be needed. Technology improvements could assist by lowering the cost of these special materials through discovery and better manufacturing process.

Coal efficiency merit much focus since coal represents over 50% of current generation in the US. Many countries in the world from Germany to Japan have demonstrated coal plants with heat rates of less than 9,000 Btu/kWh. The US has also demonstrated such technology since the 1950's. However the US coal fleet current operating heat rate is nowhere near those levels, 10,400 Btu/kWh. The US fuel diversity, relative abundance of various fuels, competitive landscape, the age of industry, and focus on reliability has lead to less efficiency in our coal fleet relative to other countries.

In the developing countries there is an opportunity to introduce much higher efficient units in the beginning. Power plants can have lifetimes greater than 40 years, so it becomes important to introduce the efficient units early in the development of the infrastructure. According to the EIA, China is expected to have slightly better coal power plant fleet efficiency as in the US by 2030.

Power plant efficiency can add value by reducing the amount of fuel used and thereby the amount of CO<sub>2</sub> emitted. With the increased efficiency in the EIA forecast the US fleet reduced CO<sub>2</sub> emissions by 261 million tons in the year 2030 versus holding current heat rates.

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### Power Plant Efficiency Outlook

#### 1. Overview of Methodology

Information was generated from publicly available reports on power generation efficiency. The reports used herein are (in order as they appear):

1. Developments in Pulverized Coal-Fired Boiler Technology J.B. Kitting Babcock & Wilcox April 10-12, 1996Energy Information Agency International Energy Outlook
2. GT World, Handbook 2006
3. Black & Veatch, Supercritical Technology Overview, February 2004, presented at the CSX Coal Forum
4. National Energy Technology Laboratory, 2006 Cost and Performance Baseline for Fossil Energy Plants, February 5, 2007
5. Energy Information Administration, Assumptions to the Annual Energy Outlook 2006, March 2006, Table 38 <http://www.eia.doe.gov/oiaf/aeo/assumption/index.html>
6. Coal Utilization Research Council, CURC/EPRI Technology Roadmap Update, September 20, 2006, page 10 <http://coal.org/PDFs/jointroadmap2006.pdf>
7. Electric Light and Power Magazine, November/December 2005, page 44
8. Coal Utilization Research Council, CURC/EPRI Technology Roadmap Update, September 20, 2006, page 10 <http://coal.org/PDFs/jointroadmap2006.pdf>
9. US EPA Integrated Planning Model, <http://www.epa.gov/airmarkets/progsregs/epa-ipm/>
10. Lange, Ian and Allen Bellas. Policy Innovation Impacts on Scrubber Electricity Usage. US EPA, National Center for Environmental Economics.
11. Braitsch, Jay. DOE/Fossil Energy Carbon Sequestration Program. September 20, 2005. [http://www.ostp.gov/PCAST/agenda\\_9\\_20\\_05\\_files/Braitsch\\_DOE-Csequest\\_PCAST\\_20Sep05.pdf](http://www.ostp.gov/PCAST/agenda_9_20_05_files/Braitsch_DOE-Csequest_PCAST_20Sep05.pdf)
12. IEA Greenhouse Gas R&D Programme, <http://www.co2captureandstorage.info/whatisccs.htm>
13. US Geological Survey, <http://ga.water.usgs.gov/edu/wupt.html>
14. US Department of Energy, NETL. Energy Penalty Analysis of Possible Cooling Water Intake Structure Requirements on Existing Coal-Fired Power Plants. October 2002
15. General Electric GER- 3696D, Upgradable Opportunities for Steam Turbines, 1996
16. *Electric Light & Power*, Operating Performance Rankings Showcase Big Plants Running Full Time Nancy Spring, managing editor November, 2005
17. The Energy Development Report of China, Edited by M. Cui, etc., Social Sciences Academic Press of China, 2006
18. Energy Information Administration/International Energy Outlook 2006, Appendix F - Reference Case Projections for Electricity Capacity and Generation by Fuel
19. Energy Information Administration Report #DOE/EIA-0484(2006), Release Date: June 2006, Figure 52 Coal Consumption in China by Sector, 2003, 2015, and 2030

#### 2. Background

Stationary efficiency is an important topic as it relates to power generation for many reasons. By definition high efficiency creates less waste, yielding higher output for any given input. Much of the discussion surrounding power plant efficiency will focus on the heat rate (Btu/kWh). This is an ideal measure of efficiency since it defines the ratio of the input as fuel (Btu) to output as power (kWh).

Efficiency improvements can have broader impacts than simple monetary gains for the plant operator. Improvements can be viewed as a fuel supply. By increasing efficiency (i.e. decreasing the heat rate), less fuel is required to generate each kWh. In effect, more fuel supply is now available than would be otherwise. In large enough volumes, this could have market impacts to fuel costs. Likewise an increase in efficiency has an impact on the level of emissions a plant releases. Since less fuel is required to generate a given kWh, fewer emissions are released for that given kWh. Again, in large enough quantities this could impact emissions markets. However, the reasons for not adopting higher efficiency technologies are that they are not necessarily comparable to existing technology. As an example, the ultra-supercritical plant has unique characteristics from higher capital cost to the unit not being able to cycle as sub-criticals historically have been able to.

The discussion will focus on current and future factors affecting stationary efficiency. Both efficiency increases and decreases and their impacts will be examined as they pertain to the future of US, world and Chinese power markets.

#### 3. Discussion

##### Factors Affecting Efficiency

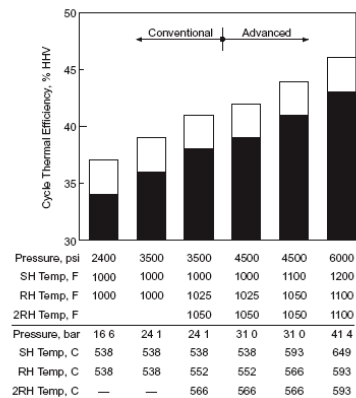
The following factors affect the efficiency of a given power plant.

*Design choices.* Designs for natural gas and coal-fired power plants represent a trade off between capital cost, efficiency, operational requirements, and availability. For example, a steam turbine system that operates at a higher temperature and pressure can achieve a higher efficiency (see figure 1).

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Figure 1<sup>1</sup>: Efficiency as a function of temperature and pressure

The higher temperatures and pressures, however, require more exotic materials of construction for both the boiler and turbine, thus the capital cost goes up. The technology has been proven and demonstrated since the 1950s. The problems were severe superheater material wastage, unacceptable creep, and thermal fatigue cracking experienced when metal temperatures exceeded approximately 1,025°F.<sup>1</sup> The issue was corrosion and strength at these extreme conditions. Heat integration represents another trade off. Rather than transferring cooling water to a process stream that needs to be cooled down and steam to another process stream that needs to be heated up, the work can be partially accomplished by bringing the two streams into thermal contact via a heat exchanger. There is a significant efficiency benefit, but process-process heat exchangers can cause operational problems, especially during transient phases and in the event of fouling or fluid leakage across the exchanger. Thus heat integration represents a trade off between efficiency and availability. Unit role, peaking, base loading, etc. affect design and operational practices of using units for a role other than which they were designed. Old base load design units are often used for cycling duty. The supercritical to ultra-supercritical units are not capable of cycling without reducing longevity and ultimately the efficiency for which was the ultimate purpose of additional investment.

<sup>1</sup> Developments in Pulverized Coal-Fired Boiler Technology J.B. Kitto Babcock & Wilcox April 10-12, 1996

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**Operational Practices.** Efficiency can be improved by pressing over fire air to the minimum, fully utilizing heat integration systems, staying after steam leaks and exchanger fouling, and a large number of other practices. Operating at full load capacity continuously will enhance efficiency. However the reality is that load is ever changing and the requirements of market based systems focus on reliability and leads to the inability to always run at full load.

**Fuel.** Among coals the higher ranking coals enable higher efficiency because they contain less ash and less water. However additional coal production is largely focused on the Powder River Basin which is sub-bituminous.

**Pollutant control.** The level of pollutant emission control (including thermal) effects efficiency. NO<sub>x</sub> reduction units and SO<sub>x</sub> scrubbers represent parasitic loads that decrease net generation and thus reduce efficiency. This issue is further discussed in latter parts of the report.

**Ambient conditions.** Colder water and ambient air achieves higher efficiency. Additionally, higher altitudes have lower ambient pressure which affects compression and expansion. For example, gas turbines produce lower power at elevations above sea level. The power output loss is a function of the loss in ambient pressure. All else equal, lower altitude enables higher efficiency.

The actual operating efficiency of a power plant is the summation of a lot of factors. The numbers presented for various types of power plants represent typical performance.

Table 1 presents data on the efficiency of commercially available power plant technology at full load and normal temperatures.

This does not account for operational issues as discussed above. Estimates for coal technology range from 7,757 – 9,275 btu/kWh (44% – 37% efficient HHV). This range offers significant improvement over the existing coal-fired plants, if units could actually run at full load, without maintenance or outage situations and standard ambient conditions.

Natural gas combined cycle (NGCC) power plant efficiency estimates range from 6,333 – 6,800 btu/kWh (50-54% efficient HHV, see box at right) at full load. Typical combustion turbine (CT) heat rates are 9,650 – 10,400 btu/kWh (33-35% efficient HHV).<sup>2</sup> The CT plants

**Definition: LHV and HHV Efficiencies**

It is important to define the efficiency terms higher heating value (HHV) and lower heating value (LHV). HHV assumes H<sub>2</sub>O is in liquid state and contains the energy of vaporization. LHV assumes gas state for all combustion products. The efficiencies of coal-fired power systems are most often reported in HHV in the U.S., much of the rest of the world uses LHV. The efficiencies of natural gas-fired power systems are most often reported in LHV. We report all efficiencies here in HHV for consistency.

The difference can be estimated by 1055Btu/Lb \* w, where w is the lbs of water after combustion per lb of fuel. To convert the HHV of natural gas, which is 23875 Btu/lb, to an LHV (methane is 25% hydrogen) would be: 23875 – (1055\*0.25\*18/2) = 21500. Because the efficiency is determined by dividing the energy output by the input, and the input on an LHV basis is smaller than the HHV basis, the overall efficiency on an LHV basis is higher.

So using the ratio: 23875/21500 = 1.11 you can convert the HHV to an LHV. So the range of 50-54% translates to 56 – 60% LHV.

<sup>2</sup> GT World, Handbook 2006

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do have a very necessary role in the US. The CC and Coal plants cannot cycle – meaning they cannot turn off and on within a few hours. The load shape and reliability require the use of CT units throughout the year. However typically they will have very low capacity factors. Over the past few years, depending on plant location, gas plants were not competitive with coal units and even combined cycle units. As a result, more cycling was required than anticipated.

Three conclusions can be drawn from the data in Table 1.

- Utility companies and other electricity suppliers can choose from a wide range of efficiencies when deploying a coal or natural gas-fired power plant.
- The average efficiency of U.S. power plants will improve as new units come online. The impact of fleet efficiency, as in cars but much longer due to longer operating lifetime, will take many years before any significant change is seen. Significant improvements in the average efficiency of U.S. power plants could be achieved via incentives to accelerate capital stock turnover. However, the ramifications of such incentives do not necessarily result in replacing the retired plant with a particular fuel and technology.
- The current stock of U.S. generation assets is not operating as efficiently as they could be, due largely to operational and economical issues. For example, the existing stock of coal plants is operating well below the efficiency of a new sub-critical plant (10,410 versus 9,276 btu/kWh). If efficiency was the goal gas plants should run over coal plants (8,000 vs 10,400 Btu/kWh). An industry-wide review of operational procedures and audit of lingering maintenance issues could produce a significant, near-term step change in average heat rate.

Collaborative industry/government research and development efforts seek to improve the efficiency of natural gas and coal-fired power plants above the level of commercially available systems. The goals of the U.S. Department of Energy are to demonstrate by 2012 at the pilot scale a coal-fired power plant with a heat rate of 6,824 btu/kWh (50% efficiency HHV). The technologies that enable that performance include H<sub>2</sub>S removal from syngas at ‘warm’ temperatures (500-700°F), membrane-based oxygen supply, advanced turbine materials, and electrochemical synthesis gas combustion. A subset of these technologies can be adopted for natural gas systems to enable a NGCC heat rate of 5,785 (59% efficiency HHV). Such systems could be online commercially in the 2015-2020 timeframe.

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Table 1: Coal and Natural Gas Power Plant Efficiency at Full Load, Current Technology and Existing Plants

Description	Order year	Capital cost (\$/kW)*	Heat rate (btu/kWh)	Source
<b>COAL</b>				
PC, Ultra sc (5500 psig, 1300F)	2006		7,757	B&V <sup>3</sup>
PC, Adv sc (4710 psig, 1130F)	2006		8,126	B&V <sup>2</sup>
IGCC, Shell, F class	2006		8,304	NETL <sup>4</sup>
IGCC	2005	\$1,443	8,309	EIA <sup>5</sup>
IGCC, E-gas, F class	2006		8,681	NETL <sup>4</sup>
PC, super (3500 psig, 1,100 F)	2006		8,712	NETL <sup>4</sup>
PC/IGCC range	2005		8,750 – 9,000	CURC <sup>6</sup>
PC	2005	\$1,249	8,844	EIA <sup>4</sup>
IGCC, GE, F class	2006		8,922	NETL <sup>4</sup>
PC, sub (2,400 psig, 1,050 F)	2006		9,276	NETL <sup>4</sup>
Median, Top 20 efficient U.S. coal power plants, 2004			9,400	ELP <sup>7</sup>
Average, all U.S. coal power plants, 2005			10,410	EIA <sup>8</sup>
<b>NATURAL GAS</b>				
Advanced NGCC	2005	\$575	6,333	EIA <sup>4</sup>
NGCC, F class	2006		6,719	NETL <sup>4</sup>
Conventional NGCC	2005	\$584	6,800	EIA <sup>4</sup>
Conventional CT	2005	\$407	10,842	EIA <sup>4</sup>
Average Gas Plant 2005			7,920	EIA <sup>4</sup>
Average, all U.S. NGCC, 2004			not available	EIA <sup>4</sup>

\*Overnight capital cost including contingency. Does not include regional multipliers or interest expense.

## Parasitic Load

Beginning with the Clear Air Act of 1970, the number of power generating units that have flue gas desulfurization (FGD or scrubber) and selective catalytic reduction (SCR) units has been increasing. Recent legislation such as the Clean Air Interstate Rule (CAIR) and Clean Air Mercury Rule (CAMR) has lead to a rapid increase of capacity with a scrubber or SCR. With cap-and-trade programs in place for SO<sub>x</sub>, NO<sub>x</sub>, and mercury the number of units with scrubbers and/or SCRs is expected to rapidly increasing over the

<sup>3</sup> Black & Veatch, Supercritical Technology Overview, February 2004, presented at the CSX Coal Forum

<sup>4</sup> National Energy Technology Laboratory, 2006 Cost and Performance Baseline for Fossil Energy Plants, February 5, 2007

<sup>5</sup> Energy Information Administration, Assumptions to the Annual Energy Outlook 2006, March 2006,

Table 38 [http://www.eia.doe.gov/total/energy\\_outlook/assumptions/index.html](http://www.eia.doe.gov/total/energy_outlook/assumptions/index.html)

<sup>6</sup> Coal Utilization Research Council, CURC/EPRI Technology Roadmap Update, September 20, 2006, page

10 <http://coal.org/PDFs/jointroadmap2006.pdf>

<sup>7</sup> Electric Light and Power Magazine, November/December 2005, page 44

<sup>8</sup> Coal Utilization Research Council, CURC/EPRI Technology Roadmap Update, September 20, 2006, page

10 <http://coal.org/PDFs/jointroadmap2006.pdf>

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next 10-15 years. The obvious environmental benefits of these emission abatement programs come at the detriment of power efficiency. Scrubbers and SCRs, like any auxiliary equipment in a power plant, require electricity to run. This electricity is obtained from the generating unit that is being controlled. This power loss is known as parasitic load. Just as heat rate is a measure of efficiency by calculating the amount of fuel needed for each kWh of power, parasitic load is an efficiency loss because a certain number of kWhs generated must be used for internal power plant use and cannot be sent to the grid to meet consumer demand.

Figure 2 shows the current and forecasted capacity (GW) that will have either a scrubber or SCR installed according to the EPA Integrated Planning Model 2006.<sup>9</sup> Scrubbed capacity is forecasted to increase from 100 GW currently to over 250 GW by 2020. Likewise, SCR installations are expected to rise from 85 GW to 220 GW over the same timeframe.

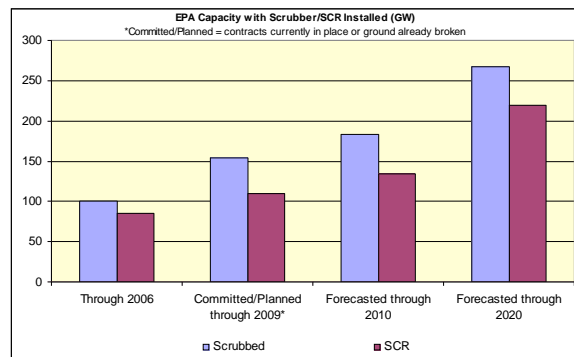


Figure 2: EPA Forecasted Capacities Installing Scrubber/SCR

Of course with parasitic load, each scrubber or SCR installation will, in effect, lower the amount of realizable capacity that can be used to meet consumer demand. Most documentation cites a 2% parasitic load for scrubber installations.<sup>10</sup> Similar documentation and anecdotal evidence suggests SCRs require about 1% parasitic load. Figure 3 shows the amount of capacity lost due to parasitic load based upon the EPA's projected installations and 2% loss for scrubbers and 1% loss for SCRs. By 2020, over 5

<sup>9</sup> US EPA Integrated Planning Model, <http://www.epa.gov/airmarkets/progsregs/epa-ipm/>

<sup>10</sup> Lange, Ian and Allen Bellas, *Policy Innovation Impacts on Scrubber Electricity Usage*. US EPA, National Center for Environmental Economics.

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GW and 2 GW of capacity are lost due to scrubber and SCR installations respectively. Emission control installations can be viewed as a load growth of 1-3% (3% if BOTH scrubber and SCR installed) or directly as efficiency loss to those units. The net effect is that new generation will be required to meet any given demand as the number of emission controls increases. Figure 3 includes current scrubber and SCR installations. Current parasitic load is being accounted for such that companies or ISOs meet reserve margins, etc. By subtracting current (through 2006) capacities from the 2020 forecasted capacities, we obtain the capacity that will be either retrofitted or new build capacity with control equipment. Assuming 2% loss for scrubbers and 1% loss for SCRs, these values come to 2.0 GW and 0.85 GW lost due to parasitic load for scrubber and SCR installations respectively. Nearly 3 GW of total new capacity will be required to meet parasitic load from scrubber and SCR installations through 2020.

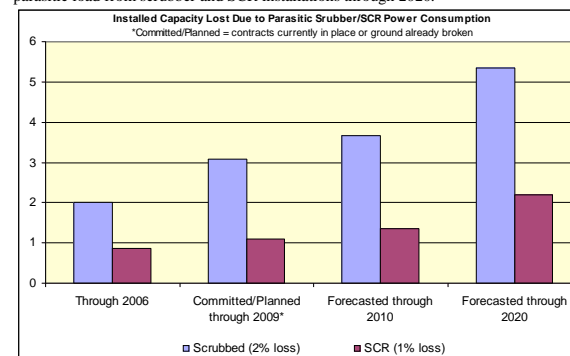


Figure 3: Calculated Total Capacity Loss from Parasitic Load (from EPA data)

Like SO<sub>x</sub> and NO<sub>x</sub>, carbon dioxide seems likely to be regulated at some point during the next decade. Carbon capture and sequestration has remained the focal point for reducing carbon emissions. This technology is still relatively new and remains very costly from a capital and energy perspective. According to the DOE, parasitic load for carbon capture currently ranges from 5-30%.<sup>11</sup> The IEA Greenhouse Gas R&D Programme estimates a 10-15% reduction in efficiency from carbon capture.<sup>12</sup> These values are ONLY associated with carbon capture. No public data is available on the load required for sequestration. These would include transportation (pipeline, etc) and compression/underground pumping. The sequestration portion would be expected to be

<sup>11</sup> Braitsch, Jay, *DOE/Fossil Energy Carbon Sequestration Program*, September 20, 2005.

<sup>12</sup> [http://www.ostp.gov/PCAST/agenda\\_9\\_20\\_05\\_files/Braitsch\\_DOE-Csequest\\_PCAST\\_20Sep05.pdf](http://www.ostp.gov/PCAST/agenda_9_20_05_files/Braitsch_DOE-Csequest_PCAST_20Sep05.pdf)

<sup>13</sup> IEA Greenhouse Gas R&D Programme, <http://www.co2captureandstorage.info/whatisccs.htm>

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very costly for parasitic load since transportation and compression are relatively energy intensive processes.

Assuming a 15% efficiency loss for carbon capture, this would cause a typical 10,500 Btu/kWh steam cycle plant to perform as a 12,000 Btu/kWh plant. A typical combined cycle unit with a 7,000 Btu/kWh heat rate would now operate as an 8,000 Btu/kWh unit. With over 70% of US power generation coming from coal and natural gas (i.e. the primary CO<sub>2</sub> emitters), any significant amount of carbon capture retrofits on existing plants could have a major impact to the overall system heat rate. Likewise, new plants with carbon capture technology will not reach their full efficiency potential due to significant losses required for carbon capture.

Overall, as emission control installations continue to increase, less power is available to meet consumer demand from the same amount of Btu fuel consumption, leading to an overall efficiency loss. This will require the installation of more capacity to meet this parasitic load.

**Water Utilization Energy Penalty**

The Clean Water Act amendments of 1977 placed certain limitations on water intake and discharge at certain facilities which included steam power plants. Water is used in large amounts as the method to cool the effluent steam from the steam turbine. Cooling water is used from an external source such as a river or lake to condense this exiting steam. In 2000 approximately 195,000 million gallons per day (MGD) were used to produce electricity in thermal plants alone (i.e. excluding hydroelectric facilities).<sup>13</sup> There are currently three major methods of cooling steam turbine effluent (in order of most to least water consumed):

- (1) *once-through cooling systems* which intake water, pump it through the condenser and directly back into the environment.
- (2) *wet cooling tower* in which the cooling water is constantly re-circulated from the condenser to a cooling tower where it cools by evaporation and convection; makeup water is added to account for water loss due to evaporation
- (3) *indirect dry cooling tower* in which cooling water is constantly re-circulated from the condenser to a cooling tower where it cools by forced air convection via metal fins

The National Energy Technology Laboratory (NETL) at the Department of Energy studied the effects of cooling water systems on power generation.<sup>14</sup> The temperature of the cooling water as it enters the condenser can have significant impacts on turbine performance by changing the vacuum at discharge from the steam turbine. In general terms, cooler water will create a larger vacuum allowing more energy to be generated. Conversely, warmer water creates lower vacuum and impedes generation. This effect is known as the energy penalty.

<sup>13</sup> US Geological Survey. <http://ga.water.usgs.gov/edu/wupt.html>

<sup>14</sup> US Department of Energy, NETL. *Energy Penalty Analysis of Possible Cooling Water Intake Structure Requirements on Existing Coal-Fired Power Plants*. October 2002

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The NETL modeled a retrofit of a once-through cooling system to both wet and dry cooling tower systems for a 400 MW unit. The annual average energy penalty for conversion to a wet cooling tower ranged from 0.8-1.5%, while the penalty was 4.2-8.8% with a dry cooling tower. Additional simulations were run for peak ambient temperatures, which also coincide with peak power demand. For the peak case the energy penalties range from 2.4-4.0% and 8.9-16.0% respectively. This is a significant amount of capacity loss during peak demand, when generating capacity is most critical.

It is important to note the potential impacts of water cooling systems on new builds, particularly west of the Mississippi. Many of future coal new builds will be built in this region due to the rise of Powder River Basin coal. Due to the arid climate, this western region is expected to have strict limitations on cooling water systems, with dry cooling towers likely being the system required. As shown above these systems can demonstrate significant efficiency losses. It is important to note that the proposed efficiencies provided in the subsequent sections may not be achievable due to the cooling water system requirements.

**Efficiency Improvement Possible From Refurbishing and Upgrading Existing Coal-Fired Power Plants.**

Existing coal-fired power plants worldwide do not achieve the highest efficiency possible based on their design. The loss of efficiency can be categorized as controllable or non-controllable. Controllable losses are generally due to poor operation and maintenance practices. Non-controllable losses are due to environmental conditions (i.e. cooling water temperature, etc), dispatching requirements (i.e. customer demand) and normal deterioration.

Deterioration naturally occurs, and if left unchecked it can become substantial. Therefore, some amount of deterioration, *normal* deterioration, will always be present and non-controllable. Most of the normal deterioration can be recovered with regularly scheduled maintenance intervals, the frequency of which determines the average based on the resulting saw-tooth curve shown in figure 4.<sup>15</sup> There is a gradual increase in the unrecoverable portion as the unit ages which would require a replacement rather than a refurbishment to eliminate. Poor maintenance practices regarding the timing of the intervals and the amount of refurbishment may result in *excessive* deterioration and is controllable.

<sup>15</sup> General Electric GER- 3696D, Upgradable Opportunities for Steam Turbines, 1996

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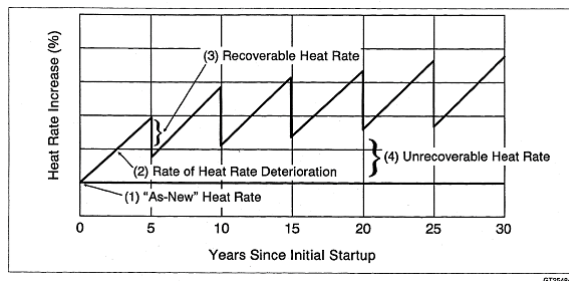


Figure 4-15: Change in heat rate over time

Poor operation is a controllable loss. It includes operating off-design (i.e. temperatures too low), running redundant equipment, particularly at part load, excessive startups due to poor reliability, unit controls not properly tuned and off role operation. Off role operation may be using a unit designed for load following (with a control stage) for base load or one designed for base load (without a control stage) for load following.

Dispatching requirements determine the generation level of the unit and is not controllable. Since efficiency drops with load, this loss can be substantial (5-10% at half load).

To summarize, starting from the unit's full load design heat rate, add in the typical losses to get to the operational (or reported) heat rate as follows

Design Full Load Heat Rate +  
Environmental Conditions [loss or gain] [non-controllable] +  
Loading [loss] [non-controllable] +  
Normal Deterioration [loss] [non-controllable] +  
Excessive Deterioration [loss] [controllable] +  
Poor O&M practices [loss] [controllable] =  
Operational Heat Rate

The last two items on the list are recoverable through routine refurbishment and correction of poor O&M practices. These categories are generally acknowledged to be on the order of 500 Btu/kWh for an average plant and can reach 1000+ in some of the more poorly run plants.

Beyond refurbishment, replacement in kind is the next step. This resets normal deterioration loss to 'as-new' values and addresses maintenance reliability problems that can impact heat rate. Replacement opens up the possibility of upgrade. Why not replace a

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part that may be 20 to 60 years old with today's technology and end up better than the original design? Turbine upgrades are prime examples. Controls, condensers and air heaters are other popular upgrades. Table 2 quantifies typical turbine upgrades and breaks the gains down between recovery (in-kind replacement) and that due to the advanced design.<sup>15</sup> Table 3 shows typical improvements for non-turbine equipment.

Table 2<sup>15</sup>: Efficiency gains for turbines

	Heat Rate Improvement - %	Output Increase - %
<b>HP Section</b>		
Advanced Design	0.40 to 0.60	0.70 to 1.00
Recovery of Aging	0.25 to 0.40	0.40 to 0.70
HP Section Total	0.65 to 1.00	1.10 to 1.70
<b>IP Section</b>		
Advanced Design	0.30 to 0.40	0.30 to 0.40
Recovery of Aging	0.10 to 0.20	0.10 to 0.20
IP Section Total	0.40 to 0.60	0.40 to 0.60
<b>LP Section Without Last Stage</b>		
Advanced Design	0.45 to 0.55	0.45 to 0.55
Recovery of Aging	0.10 to 0.20	0.10 to 0.20
LP Section Total	0.55 to 0.75	0.55 to 0.75
<b>Last Stage</b>		
Advanced Design	0.70 to 1.30	0.70 to 1.30
Recovery of Aging	0.05 to 0.15	0.05 to 0.15
Last Stage Total	0.75 to 1.45	0.75 to 1.45
Longer Last Stage Bucket	1.00 to 1.60	1.00 to 1.60
Total for Advanced Design	2.85 to 4.45	3.15 to 4.85
Total Recovery of Aging	0.50 to 0.95	0.65 to 1.25
Potential Improvement	3.35 to 5.40	3.80 to 6.10

GT25405

Table 3: Efficiency gains on various plant equipment

Equipment (other than Turbines)	Description of Efficiency Loss	Cycle Efficiency Impact	Type of Change	Source
<b>Pulverizers</b>	Fly ash carbon content of 1% - 30%, Impact of 30%	0.2% to 0.5%	Recovery	APEC document
<b>Air Heaters</b>	Excessive leakage, High delta P	0.2% - 1.5%	Recovery & upgrade of seals	APEC document
<b>Forced Draft, Primary Air, and Induced Draft Fans</b>	Does not match current system design.	2% - 8%*	Up-grade to match current system design	APEC document
<b>Condenser</b>	Air in leakage, Fouling, Original design	2%	Recovery & up-grade of design	Intek, Inc abstract for January 2007

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	of air removal equipment			EPRI Heat Rate Improvement Conference
<b>Control and Instrumentation</b>				
<b>Overall Unit</b>	Controllable Losses	5%-10%		Storm Technologies abstract for January 2007 EPRI Heat Rate Improvement Conference
* This range of values is predominately capacity rather than heat rate. The cause is most likely higher pressure drops caused by scrubber and/or SCR retrofits. Only what is lost can be recovered, so it should not be assumed that the maximum value can be applied to more than a small number of units. There may be some heat rate improvement due to advanced design replacement fans, but that is relatively small compared to the capacity recovery.				

The text below is taken directly from a report, Costs And Effectiveness Of Upgrading And Refurbishing Older Coal-Fired Power Plants In Developing Apec Economies, published in June of 2005 by APEC (Asia Pacific Economic Cooperation) Energy Working Group. It describes a number of unit operations in a power plant that typically contribute to sub-standard efficiency. A given power plant generally will not have one big issue affecting efficiency, but rather several big issues and a large number of small refinements.

For the past ten years, U.S. AID has been conducting efficiency audits at power plants in India and China. An audit requires the purchase of several hundred thousand dollars worth of diagnostic equipment and evaluation of 4-6 experienced professionals working onsite at the power plant for up to six months. It is a significant undertaking, but based on the experiences of AID, well worth the effort.

Beginning in 2007 the Asia-Pacific partnership plans to initiate a 6-country peer review of power plant efficiency practices. The participating countries are the U.S., China, India, Australia, Japan, and Korea. The effort is being coordinated by EEI (Edison Electric Institute).

**Equipment Refurbishing and Upgrading Options (taken from APEC document, June 2005)**

*Air Heaters*

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Air heaters heat combustion air and cool boiler exit flue gas. Boiler efficiency is improved and the hot air needed for drying coal and obtaining proper combustion is provided to the pulverizers and burners. The two types of air heaters used most often are the regenerative and tubular air heaters.

Air heater operating deficiencies include excessive leakage of combustion air into the boiler exit flue gas flow, low air temperatures to the pulverizers and burners, excessive air and flue gas pressure loss. These problems cause lower boiler efficiency, reduced gas and air flows, reduced air temperatures, and reduced coal input that can limit boiler output. Pollutant emissions often increase because lower boiler efficiency requires increased coal consumption. Air leakage results in increased flue gas flows that consequently reduce precipitator collection efficiency.

Performance improvement depends on the design and the current performance of the existing air heater. Flue gas leaving some operating air heaters has exceeded the design value by 5 °C to 20 °C and air leakage to into the flue gas flow may reach 40%. As a result of these conditions, boiler efficiencies can decrease in the range of 0.2% to 1.5%. These deficiencies can be corrected by air heater improved surface cleaning, air to gas path seal improvements, and other upgrading and refurbishment.

*Pulverizers*

Pulverizers dry and process coal to a fine powder that is required in the burners. Improved and refurbished pulverizers often reduce unburned carbon, which is wasted fuel. Fly ash carbon content in the range from 1% to over 30% has been encountered. A 30% fly ash carbon content will cause a loss of boiler efficiency in the range of 0.2% to 0.5%.

Pulverizer upgrading and refurbishment can also reduce the amount of ash slag (iron, silica, calcium and other coal ash constituents) that collects on furnace walls, superheaters, and reheaters, thereby improving heat transfer and boiler efficiency. These ash accumulations may also cause overheating and corrosion of boiler tubes, causing failures that require boiler shutdown for repairs.

*Burners*

Burners mix coal and primary air with secondary air for injection into the furnace. With improved burners and instrumentation more complete combustion of the coal with lower NOx emissions is possible. In addition, with new burners and instrumentation, operators can adjust air and coal flow for complete combustion and lower unburned carbon, and reduce water wall slagging and superheater/reheater slagging and fouling. These improvements result in better heat transfer within the furnace and improved boiler efficiency. Improved coal feeders and pulverizers may also be needed to achieve the benefits of improved boiler efficiency. As noted above for improved pulverizers, the impact on boiler efficiency can be significant.

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### *Burner Furnace Sootblowing Upgrades*

Improved or additional sootblowers increase furnace, superheater, and reheater heat absorption leading to increased boiler efficiency, reduced coal consumption, and lower emissions by maintaining these tube surfaces reasonably clear of ash accumulations that reduce heat transfer.

### *Steam Turbines*

Steam turbines convert the boiler steam energy into rotating energy for turning the generator.

Improving steam turbine performance by refurbishing will result in significant performance improvements. Refurbishments include removing deposits that cause a reduction in blade aerodynamic performance, repairing or replacing the first stage turbine blades that have been damaged by boiler tube scale, replacing or adjusting blade and shaft seals, and other activities. In addition, major performance improvements can be implemented on many turbines with newer, more efficient turbine blades and other components. These improvements are possible because current turbine designs perform more efficiently than the designs that were available ten to twenty years ago.

### *Condensers*

Condensers receive steam from the steam turbines where cooling water flowing through tubes cools and condenses the steam. Condensing lowers steam turbine exhaust pressure and increases turbine efficiency. Also, condensing the steam allows pumping and recycling the high quality water to the boiler.

Scaling on the water-side of the condenser tubes decreases the heat transfer coefficient and higher condenser pressures result. Increased condenser pressure will significantly reduce steam turbine output and efficiency. Air leakage into the condenser can also increase condenser pressure and will lower the quality of the recycled water.

### *Forced Draft, Primary Air, and Induced Draft Fans*

Forced draft (FD) fans supply air to the burners and in some systems to the pulverizers. With a pressurized furnace, the forced draft fans provide sufficient pressure for the flue gas flow through the furnace, air heater and flue gas cleanup equipment to the chimney. Some boilers have primary air fans that supply air to the pulverizers, whereas some boilers have blowers or exhausters on each pulverizer. Induced draft (ID) fans move flue gas from the furnace through the air heaters and flue gas cleanup equipment to the chimney.

Increased fan flow and pressure are required for various reasons:

- Changes in the coal quality and moisture.
- Air heater and other equipment pressure losses have increased.

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- Air pollution control or burner modifications have increased air and flue gas pressure losses.
- The original design pressures and flows for the fans were not adequate for the current actual operating situation.

Unit output reductions from fan performance deficiencies have been encountered that have reduced unit output in the range of 2% to 8%.

### *Control and Instrumentation*

Control and instrumentation improvements can reduce total fuel consumption due to quicker and more coordinated startups, and provide better control of fuel and air during normal operation. The main impacts of improved controls are improved operating efficiency due to better control of excess air and steam pressure and temperature, as well as faster load changes in response to the generating system requirements. In addition, boiler and turbine stresses are reduced because startup and load changing is coordinated to reduce temperature and pressure variations. This often provides higher unit availability because of the decrease in thermal stresses and inadvertent unit trips during generating system transients, which, in turn, lead to turbine, boiler and other equipment failures. (end of APEC document)

Advancement in design opens up another possibility, modifying the original design of a unit. This can be as "simple" as resizing the backend of the turbine to increase flow capability or reduce losses due to being undersized in the original economic analysis (low fuel prices) or as complicated as totally replacing major pieces of equipment and modifying the cycle. In some cases, such as turbine nozzles, the replacements can be designed to have a lower rate of deterioration. In the extreme, this type of upgrade can become a repowering option where the boiler is replaced by combustion turbines, a new boiler or converted (CFB). Significant efficiency and fuel changes are possible. To summarize, deterioration can be addressed as follows:

- Refurbishment
- Replacement in kind
- Upgrade with advanced design
- Modify original design
- Repowering
- Retirement with replacement by new construction

Given the large aggregate capacity of existing coal-fired power plants and their long useful life, efforts to improve the average efficiency of the existing stock by one or two percent could have a significant near term impact on fuel consumption rates and greenhouse gas emissions. Every plant, based on age, condition and economics will fall at one of the levels on the above list, with most of them in the top 3 categories. Different pieces of equipment might be at different levels for the same plant. The amount of gain is also a function of the plant's design and situation. Finally, when all is considered, most

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plants will fall in the 3-6% range of possible improvement. The practical or economic values will be lower. The newer plants might be in the 2-4% range and a certain population might be 2% or less because they were already upgraded.

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### Forecasted Efficiency

Two primary sources for analyzing the past and the future of power generation efficiency are the Energy Information Administration's (EIA) Annual Energy Outlook 2007 and the International Energy Agency's (IEA) World Energy Outlook. The overall measure of power plant efficiency comes from the heat rate (Btu/kWh). This accounts for the total heat (i.e. fuel) required to generate each kWh. Highly efficient units will require less heat/fuel to generate each kWh. Heat rates were calculated from the provided data for each report to develop trends in power plant efficiency. This analysis is centered on fossil fuel generation. General consensus is that petroleum generation will continue to decline, so we will further focus our discussion on only natural gas and coal-fired generation.

#### United States

Figure 5 shows historical and forecasted heat rates from US natural gas and coal-fired power plants. Historical calculations are based upon EIA data. The post-war boom of the late 1940s and 1950s saw a large increase in new power plants. However, these were, by today's standards, highly inefficient plants, with the overall fleet heat rate starting in 1949 at nearly 15,000 Btu/kWh. By the end of the 1950s, more efficient plant constructions drove the fleet heat rate to approximately 10,300 Btu/kWh, where it remained relatively unchanged until the end of the century.

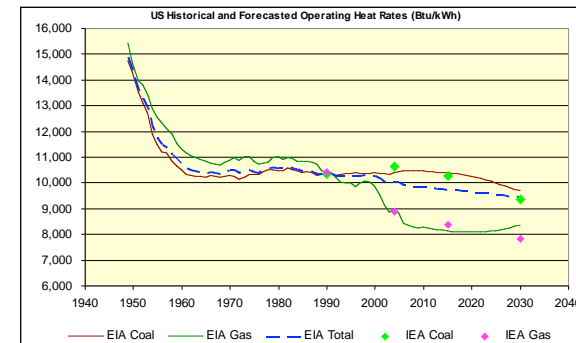


Figure 5: Historical and forecasted heat rates from EIA and IEA

The overbuild of natural gas combined cycle units in the late 1990s decreased the natural gas fleet heat rate below 9,000 Btu/kWh, where it currently resides. However with the recent higher natural gas prices, coal generation still represents over 50% of current US

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power generation. Therefore overall US fleet heat rate was not impacted by the large combined cycle build since coal-fired heat rates remain around 10,400 Btu/kWh.

The EIA is projecting the natural gas fleet heat rate to continue to decline. Around 2023, generation from gas units decreases faster than consumption, resulting in a slight increase to 8,300 Btu/kWh. Currently, best technology combined cycle units can achieve ~5,700 Btu/kWh [General Electric H-System]. The gas heat rate includes CT plants which could have heat rates as high as 13,000 and as low as 8,550 Btu/kWh in the future according to the EIA. These types of units will continue to be needed as they have the ability to turn on and off over a small time period leading to increase system stability.

The EIA is forecasting moderate improvements in the coal fleet heat rate, achieving 9,700 Btu/kWh by 2030. In terms of percentage improvement it is approximately the same trend as gas units. This indicates many more new coal plants as compared to new gas plants in the projection. To see any appreciable improvement in fleet heat rate, a large number of new, efficient units would need to replace a large number of old, inefficient units and/or existing units would have to be retrofitted. With 40 year life spans and high capital costs (vs. gas plants) to construct, and risk of a CO2 constrained environment, this is not achieved very quickly. The difference in fuel price (coal vs. gas) is another major driver for increased efficiencies in gas plants compared to coal plants. Major increases in combined cycle efficiencies will make those units more competitive with coal in dispatch. With coal's current fuel pricing advantage, there is less incentive to make wholesale improvements in efficiency versus focusing on availability. Table 4 shows the EIA assumptions for new build heat rates for 2005, n<sup>th</sup>-of-a-kind in the future and the best observed heat rates to date. Observed data for combustion turbines is not provided since efficiency is not their primary role in the supply stack. These units are used primarily as peakers, where efficiency is not of utmost concern.

Table 4: EIA heat rate assumptions (all values Btu/kWh)

Technology	Heat Rate in 2005	Heat Rate n <sup>th</sup> -of-a-kind (% improvement from 2005)	Best Current (2004) <sup>16</sup>
Scrubbed Coal	8,844	8,600 (2.8%)	8,842*
IGCC	8,309	7,200 (13.3%)	N/A
IGCC w/ carbon sequestration	9,713	7,920 (18.5%)	N/A
Conv. CC	7,196	6,800 (5.5%)	6,335*
Adv. CC	6,752	6,333 (6.2%)	N/A
Adv. CC w/ carbon sequestration	8,613	7,493 (13.0%)	N/A
Conv. CT	10,842	10,450 (3.6%)	N/A
Adv. CT	9,227	8,550 (7.3%)	N/A

\* Coal = TVA, Bull Run Plant; CC = Sempra, Elk Hills Power

<sup>16</sup> Electric Light & Power, Operating Performance Rankings Showcase Big Plants Running Full Time Nancy Spring, managing editor November, 2005

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The EIA forecasted heat rates for new builds seem reasonable when compared to the best operational CCs and coal units in 2004. In fact, the forecasted CC heat rate may be a bit conservative, considering new technology (GE H-System) has exhibited heat rates around 5,700 Btu/kWh. The forecasted coal heat rate is slightly less than current operational technology, so the EIA is assuming technology advances. In light of the cooling water system requirements (especially in the west), the forecasted heat rate may not be achievable without future technology advances.

Historical EIA and IEA generation and fuel consumption varied slightly for the US, while the IEA provides fuel consumption for combined power and heat plants. To mitigate this discrepancy, it was assumed that historical EIA data for the US was correct. The 1990 IEA data was then normalized to the EIA data. Each normalization factor was used to scale the forecasted IEA data, so it could be directly compared with the EIA forecasted data. Figure 5 shows the IEA forecasted heat rates for both coal and gas-fired plants. The IEA and EIA forecast very similar coal-fired heat rates, but differ slightly in 2030 with EIA forecasting 9,700 Btu/kWh and IEA projecting 9,400 Btu/kWh. The forecasts slightly diverge in gas-fired heat rates, with the EIA having the anomaly decrease (rise of heat rate) in efficiency starting in 2023.

According to the EIA Annual Energy Outlook, the coal-fired fleet heat rate shows improvement over the forecast horizon. To determine how much of this improvement comes from new generation versus improvements to existing units, the heat rates for each were back calculated. Table 5 shows the methodology used in calculating the heat rate of existing units. Equation 1 shows the calculation used for determining weighted-average heat rates for existing and new units. Total generation, total coal heat rates and the mixture of pulverized/IGCC new builds are all available from the EIA Annual Energy Outlook. From those given values, all other values necessary to derive future heat rates for units existing in 2007 can be obtained. Solving Equation 1 for  $HR_{exist}$  yields the value we are seeking. New build capacity by year is available in the Annual Energy Outlook. The EIA assumed new pulverized coal units have a heat rate of 8,600 Btu/kWh, while new IGCC units have a heat rate of 7,200 Btu/kWh. Assuming a capacity factor of 80% for all new coal generation, the amount of total generation from existing and new units can be calculated. According to the Annual Energy Outlook 2006, coal new builds in 2015 were 72% pulverized and 28% IGCC. The mixture in 2030 was 40% and 60% respectively. This data is not yet available for the 2007 report, so the new build mixture is assumed unchanged from the 2006 report. For the years 2015-2030, the ratio of pulverized and IGCC new builds was linearly interpolated to get a curve for new pulverized and IGCC generation. Using a weighted-average heat rate calculation based on the above information, the heat rate for existing units was calculated and is shown in Figure 6. Heat rates remain relatively flat through 2030.

Table 5: Methodology for back calculation of existing unit heat rates

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ID	Value	Formula	Notes
[1]	Total Generation (MWh)	given	Provided EIA AEO
[2]	Cumulative New Build Generation - 80% CapFact	=NewBuildCoalCapacity/9760*0.80	NewBuildCoalCapacity Provided EIA AEO
[3]	% New Coal Pulverized	linearly interpolated over 2015-2030	Provided EIA AEO 2006
[4]	% New Coal IGCC	linearly interpolated over 2015-2030	Provided EIA AEO 2006
[5]	New Pulverized Generation	=[3]*[2]	
[6]	New IGCC Generation	=[4]*[2]	
[7]	Existing Unit Generation	=([1]-[5]-[6])	
[8]	Total Heat Rate	given	Calculated EIA AEO
[9]	New Heat Rate	see Eq. 1	
[10]	Existing Unit Heat Rate	see Eq. 1	

$$\frac{(HR_{exist} \times Gen_{exist}) + (HR_{new} \times Gen_{new})}{Gen_{exist} + Gen_{new}} = HR_{total} \quad \text{Eq. 1}$$

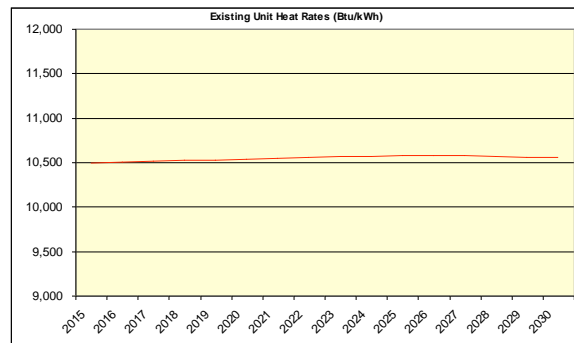


Figure 6: Heat rate at existing coal units according to EIA

According to the EPA, as discussed above, nearly 270 GW will be scrubbed by 2020. This amounts to nearly 90% of all coal units, including new builds which are all assumed to be built with scrubbers and SCRs. By 2020 about 18% of existing coal units will be retrofitted with a scrubber (this does not include units that currently have scrubbers in 2006). The net change in heat rates through 2030 is nearly 0%. This means that any loss due to parasitic load must be identically offset by improvements in efficiency through other retrofits or refurbishing. Based on scrubber retrofits alone, (18%\*2% parasitic load) this means that the coal fleet efficiency improvement is 0.36% for existing units. SCRs are not taken into account in this analysis since they are installed on gas units as well. Also, SCR and scrubber installations are not mutually exclusive, as many coal units will install both. Assuming the fleet heat rate would still remain flat with SCR installations, an even larger improvement would be required to identically offset the parasitic load losses. This value is between 2-3% (scrubber = 2%, SCR = 1%). The improvement to existing unit heat rates is not attributed to the retirement of less efficient units (i.e. "addition by

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subtraction"). By 2030, retired coal capacity is only 1.29% of the entire coal fleet capacity. Considering this 1.29% would have lower capacity factors than the units replacing them, their impact is considered negligible to the observed efficiency improvement.

CO<sub>2</sub> Impact in United States

Using the EIA forecasted heat rates, CO<sub>2</sub> emissions were calculated using standard emission rates of 205 lb/mmBtu and 115 lb/mmBtu for coal and gas units respectively.

Five scenarios were compared:

1. CO<sub>2</sub> Locked at Current HR – 2007 HRs are used in perpetuity
2. CO<sub>2</sub> at EIA Forecasted HR – forecasted decrease in HR is used
3. CO<sub>2</sub> If 1/2 Coal Goes to Gas – 50% of coal generation goes to gas generation
4. CO<sub>2</sub> with 2x Coal Turnover – the percentage of coal fleet that is new build is doubled (i.e. by 2030 65% is new build as opposed to the EIA base of 32.5%)
5. CO<sub>2</sub> with 5% Improvement to Current HR – current heat rates improved 5%

Figure 7 shows the 2030 CO<sub>2</sub> emissions for each case. As might be expected the scenario in which 50% of coal generation goes to gas generation yields the lowest CO<sub>2</sub> emissions. This is accounted for by the double reduction effect of heat rate and emission rate. Coal units have higher heat rates and emissions rates. Reducing 50% of that generation by both heat rate and emission rate has a multiplicative effect on total CO<sub>2</sub> emissions. Below is a simple illustration of the effect on CO<sub>2</sub> by replacing coal generation with gas generation

$$\text{Coal: } \frac{205 \text{ lb CO}_2}{\text{mmBtu}} \times \frac{10.5 \text{ mmBtu}}{\text{MWh}} \times \frac{\text{ton CO}_2}{2000 \text{ lb CO}_2} = \frac{1.08 \text{ ton CO}_2}{\text{MWh}}$$

$$\text{Gas: } \frac{115 \text{ lb CO}_2}{\text{mmBtu}} \times \frac{7.0 \text{ mmBtu}}{\text{MWh}} \times \frac{\text{ton CO}_2}{2000 \text{ lb CO}_2} = \frac{0.40 \text{ ton CO}_2}{\text{MWh}}$$

By replacing 1 MWh of coal generation with gas, only 37% as much CO<sub>2</sub> is emitted.

Figure 8 shows the total CO<sub>2</sub> emission savings for the timeframe 2007-2030. As expected, replacement of coal generation with gas generation has the largest impact followed by replacement of old coal generation with new coal generation.

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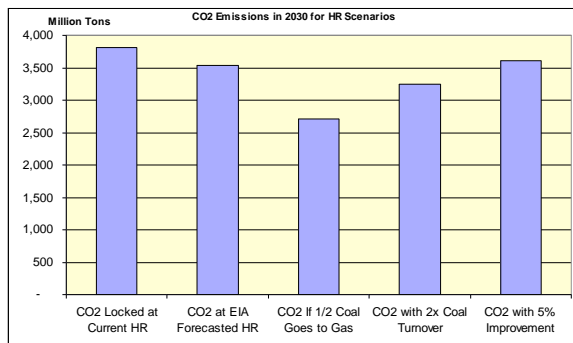


Figure 7: CO<sub>2</sub> emissions in 2030 for various scenarios calculated from EIA Annual Energy Outlook

As always, there are trade-offs. In a carbon constrained world it would be easy to suggest the '1/2 Coal Goes to Gas' scenario. However, the amount of natural gas consumption jumps dramatically to meet this excess demand. With coal accounting for 50% of power generation, this is a significant shift – 25% of total generation moving to gas. Figure 9 shows gas consumption for power generation in 2030 for the given scenarios. With over 3 times the gas consumption for the '1/2 Coal Goes to Gas' scenario as the EIA base forecast, significant price changes in natural gas would occur. This would make coal more attractive, thus increasing CO<sub>2</sub> emissions until a final equilibrium is obtained. The above scenarios are simply illustrations of the potential impacts that efficiency can have on CO<sub>2</sub> emissions and gas consumption. In reality, market forces will act to temper extremes toward equilibrium.

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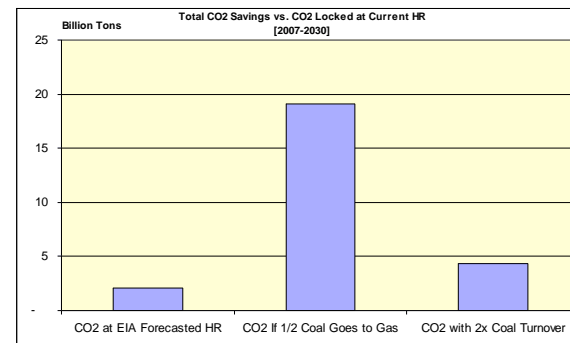


Figure 8: Total CO<sub>2</sub> emission savings vs. the total emitted if 2007 HRs locked in perpetuity

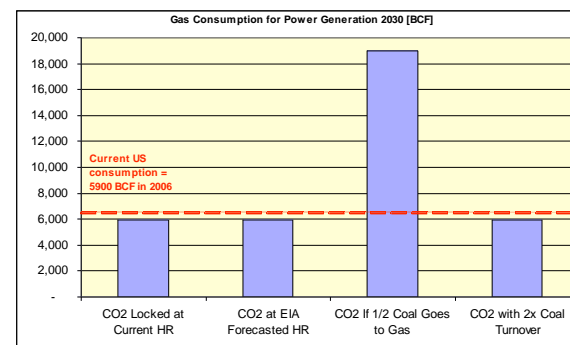


Figure 9: Gas consumption in 2030 for various scenarios calculated from EIA Annual Energy Outlook

World and China

Since historical data does not align properly between EIA and IEA, heat rate improvements were examined for the world and China, as opposed to absolute heat rate

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values. Figures 10-12 show the percentage improvements in heat rate for EIA and IEA from each agency's base year. As one might expect, heat rate improvements in China are expected to outpace worldwide improvements. Rapidly growing power demand is expected to drive a large increase in the number of new builds. With a larger percentage of fleet capacity coming from newer, efficient units, it is expected that overall improvements would increase rapidly in China. Worldwide heat rate improvements are forecasted to increase moderately for both gas and coal plants according to both EIA and IEA. Again, this is the result of gradual replacement of older, inefficient units with new, efficient ones. The slower pace of this replacement leads to the slower increase in efficiency when compared with China alone.

An important distinction to note between the EIA and IEA forecasts is the heat rate improvements of coal vs. gas. The EIA forecasts gas improvements for the world and China to greatly outpace improvements to coal-fired generation. Inversely, the IEA forecasts coal to improve more rapidly than gas-fired plants. There are two schools of

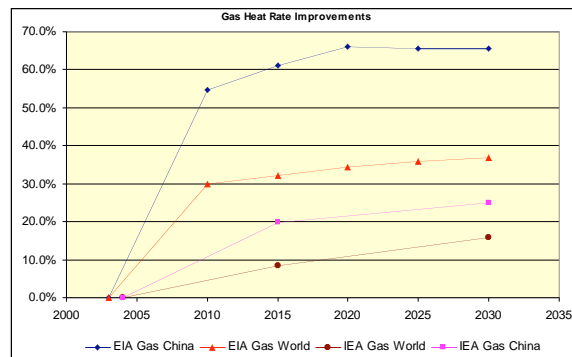


Figure 10: Gas heat rate improvements

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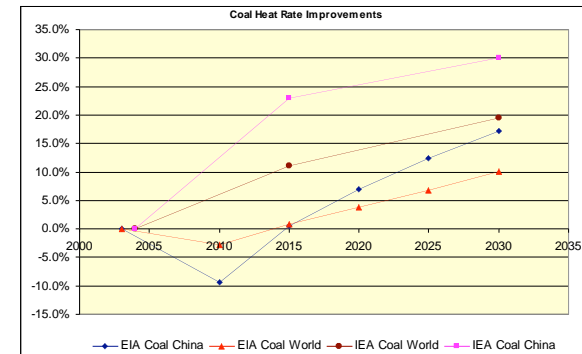


Figure 11: Coal heat rate improvements

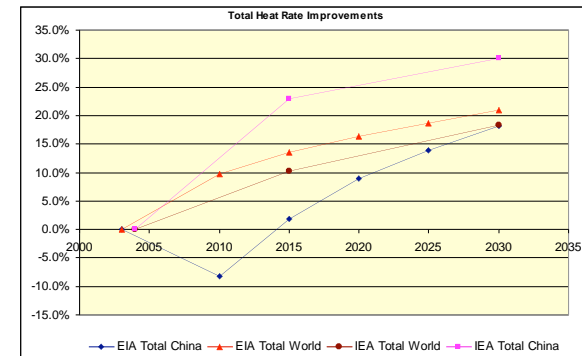


Figure 12: Total heat rate improvements

thought that can justify either scenario. One could argue that gas heat rates are expected to rapidly improve due to a large buildup of highly efficient combined cycle units. This is

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the same phenomenon that was seen in the United States during the 1990s. With a rapid increase of combined cycle units, the gas heat rate quickly declines. The large improvements in coal-fired heat rates could be justified by determining that gas-fired heat rates are asymptotically approaching their maximum achievable efficiency (though not achievable, 100% efficiency is 3,412 Btu/kWh). Steam cycle coal units theoretically have more room for improvement since they are less efficient from the start.

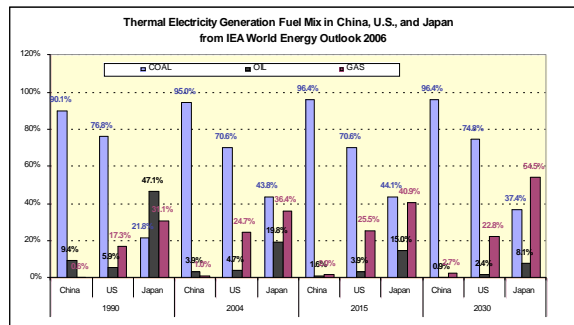


Figure 13: Fuel mix for thermal power plants in China, U.S., and Japan

Recently, a blue book of energy of China<sup>17</sup> reported historical heat rates for Chinese power plants. The blue book data on Chinese coal-fired power plant efficiencies are not consistent with those forecasted by the Energy Information Administration. In its reference case, EIA forecasted electricity generation, coal consumption and coal-fired generation in China, as listed in Table 6. Based on the EIA data, the heat rates for coal-fired power plants in China are calculated and listed in Table 6, and the calculated heat rates for 2003 and 2015 are much higher than those for 2002 reported by the blue book, as shown in Table 7. From Table 6, coal-fired generation in 2015 almost doubles that of 2003, which indicates that about 50% of electricity will be generated from new coal-fired plants built after 2003. However, the average heat rate only decreases 0.4% from 2003 to 2015. These new-builds will have an average heat rate of 11,426 Btu/kWh with assumptions of no retirement of old plants and constant capacity factor for all plants. If the retirement of old plants and higher capacity factors for the new builds are taken into consideration, the new builds' average heat rate will be higher than 11,426 Btu/kWh. This value seems much too high considering US new builds are currently achieving heat rates lower than 9,000 Btu/kWh. As a comparison, the average heat rates of U.S. coal-fired power plants from EIA are listed in Table 6. Because of scarcity of reliable data, the

<sup>17</sup> The Energy Development Report of China, Edited by M. Cui, etc., Social Sciences Academic Press of China, 2006

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uncertainty of the efficiencies of coal-fired power plants in China exists and is not ready to be solved at present. Also, this uncertainty has a huge impact on estimating CO<sub>2</sub> emissions from Chinese coal-fired plants. The CO<sub>2</sub> emissions from Chinese coal-fired plants for 2003 will be 8.2%, or 137 million tons, less if the average heat rate of 10,580 Btu/kWh in Chinese coal-fired plants from the Blue book is used, than that calculated from average heat rate of 11,530 Btu/kWh from the EIA. In a less-conservative way, if 17.1% decrease in the average heat rate from 11,530 Btu/kWh in 2003 to 9,560 Btu/kWh in 2030 for Chinese coal-fired power plants from the EIA is applied to the derived average heat rate of 10,580 Btu/kWh from the Blue book, there are 422 million tons of CO<sub>2</sub> emissions less than that based on the EIA forecasted 9,560 Btu/kWh. These calculations indicate that it is important to improve the data collection on CO<sub>2</sub> emissions issue before a reliable conclusion should be made.

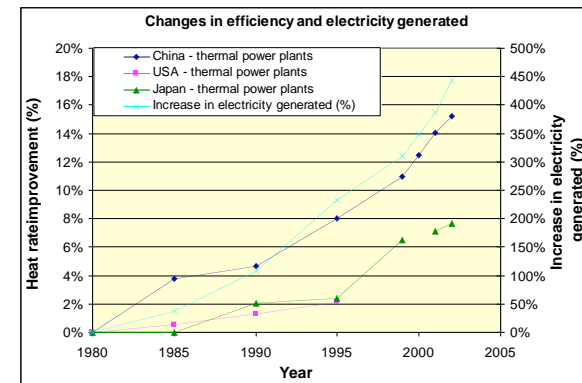


Figure 14: Historical efficiency improvements according to The Energy Development

Table 6: Electricity generation coal consumption and coal-fired generation in China

Year	2003	2015	2030
Generation (Billion kwh) <sup>18</sup>	1414	2788	5243
Coal consumption (Quadrillion Btu) <sup>19</sup>	16.3	32	50.1
Calculated average heat rate (Btu/kWh)	11,530	11,480	9,560
U.S. average heat rate (Btu/kWh)	10,310	10,370	9,670

<sup>18</sup> Energy Information Administration/International Energy Outlook 2006, Appendix F - Reference Case Projections for Electricity Capacity and Generation by Fuel

<sup>19</sup> Energy Information Administration Report #DOE/EIA-0484(2006), Release Date: June 2006, Figure 52 Coal Consumption in China by Sector, 2003, 2015, and 2030

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Table 7: Comparison of coal-fired heat rates in Btu/kWh from different sources

Year	2002	2003
The Blue Book <sup>17</sup>	10,580	
EIA		11,530

Improvement in coal-fired power plant efficiency in China has a great impact on the CO<sub>2</sub> emissions. If the coal-fired power plants in China kept their efficiency unchanged at the 2003 level, Chinese coal-fired power plants would emit 1 billion tons more CO<sub>2</sub> in 2030 under an assumption of 205 lb CO<sub>2</sub>/mmBtu than it would if it had the 2030 forecasted heat rate of 9,560 Btu/kWh. To yield the Chinese forecasted heat rate of 9,560 Btu/kWh, all new coal plants built after 2003 would need to average 8,830 Btu/kWh. This highlights the imperative nature of the need to start installing more advanced coal plants in China versus their historically installed plant technology.

Overall, the EIA and IEA are forecasting fleet improvements to power plant efficiencies. The need for more efficient gas units in addition to technology improvements requires market influence. With gas prices at much higher levels relative to coal prices the need to increase efficiency becomes greater for a gas plant to make up the fuel price difference to a coal plant in dispatch. With an increasing amount of generation coming from coal-fired plants, the overall system fleet heat rate decreases at a slower rate than is seen for gas units alone. This is the weighted-average effect of coal-dominated generation.

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### 4. Policy Recommendation

Promoting efficiency seems to be an obvious choice, but the implementation of a policy needs to be cognizant of the cost and operational sensitivity of the utility industry. Over 50% of current US power generation comes from coal, which shows the most room for efficiency improvement. However, reliability will continue to be important over efficiency. Retrofitting and refurbishing of the aging US fleet will likely yield only minimal efficiency improvements (5-10%). Counteracting this, emission control retrofits will lead to a decrease in efficiency due to their parasitic load.

- Technology research in advanced materials will be required to lower the capital costs of higher efficient units that require exotic materials of construction
- Increasing fleet turnover will yield the greater efficiency improvements by replacing older, less efficient units with newer, more efficient ones. However, without considering a balanced generation mix, a larger dependence on foreign fuel will occur, in particular LNG
- For the world and China, it is imperative that better data be obtained to understand the ramification of future power markets
- Construction of highly efficient plants is critical particularly in developing countries where the fleets have large room to grow. With 40+ year lifespans, it is important that new units be as efficient as possible with balancing the reliability concerns.

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ACTA ACUSTICA UNITED WITH ACUSTICA  
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## Experimental Investigation of Noise Annoyance Caused by High-speed Trains

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### Summary

A field experiment was conducted, to investigate the possible differences in perceived annoyance of noise caused by the traffic on a highway, by conventional trains and by high-speed trains, both conventional and magnetic levitation. The design of the experiment was different from earlier research in many ways. Most importantly, it was conducted in a realistic setting, a holiday cottage, and during the tests the participants were engaged in light daily activities. Traffic noise was reproduced in an ecologically valid way through loudspeakers placed outdoors. A stepwise selection of panelists was based on a screening questionnaire that was administered at the doorstep of 1500 persons living in the test site surroundings. The 100 panelists were selected to be representative of the Dutch population. The  $L_{Aeq}$ -annoyance relationships determined for the conventional high-speed train and for the magnetic levitation high-speed train did not differ significantly. The annoyance differences observed could be explained in terms of train noise differences in rise time and in propagation effects due to the distance between the track and the listening (recording) position.

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## 1. Introduction

A difference in perceived annoyance between train and other traffic noise at the same average sound level, has been observed in several field studies in the past [1, 2, 3]. In a number of countries, this observation has led to less restrictive regulation, or *railway bonus*, for train noise relative to noise from other sources such as highways, major roads or aircraft (usually 5 dB(A); see e.g. the German, French or Austrian legislation). With the introduction of high-speed trains and train-like transportation systems based on magnetic levitation (maglev), the question has arisen whether a difference in perceived annoyance of train and highway noise still exists. In particular, it is probable that spectral changes due to a higher fraction of aerodynamic noise and shorter rise times due to high speeds, would change the perception of high-speed train and maglev train noise.

The main goal of this research was to investigate the possible differences in annoyance, on the one hand, between magnetic levitation and conventional high speed trains and, on the other hand, between highway noise and train noise. Next to this, the influence of some additional

factors on noise annoyance was studied, such as the distance between the source and the listener, the speed of the source and the rise time of the sound.

Prior laboratory research by Fastl and Gottschling [4] showed no significant difference in noise annoyance of a Transrapid 07 maglev train at a speed of 400 km/h and a conventional high-speed train at a speed of 250 km/h, if presented at a comparable A-weighted equivalent sound level. Conversely, Neugebauer and Ortscheid [5, 6] concluded that maglev noise annoyance differed markedly from that of a conventional train. An experiment by Vos [7, 8] showed that, if the outdoor ASEL (A-weighted Sound Exposure Level) was set equal, the Transrapid 08 maglev train was more annoying than a conventional intercity train, and approximately equally annoying as road traffic.

In addition to the fact that these previous studies were inconclusive, a few factors of potential importance were not explicitly considered in previous work. Firstly, in listening experiments with short fragments of noise, listeners assess the perceived annoyance of noise. Such assessments cover both perceived loudness and perceived character of noise (e.g., see [9]). However, for short fragments of sound, the temporal effect may partly contribute to the annoyance differences between trains and continuous traffic sound. Longer exposures, containing several train passages as well as the typical quiet periods in between, were

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necessary to include in this experiment. Secondly, in real life, sounds may be annoying also because they change adversely the current soundscape or are associated with a cultural change or they interfere with activities, for example, reading or relaxation. This latter “acute” but important aspect of noise annoyance is not captured in traditional listening experiments, but is possible to assess, if the experiment is designed in the right way, as shown in [10, 11]. Finally, it is well known from environmental noise questionnaire surveys that personal factors such as noise sensitivity influence annoyance reports [12, 13]. Some of these factors have also been observed in listening experiments [14, 15]. Therefore, the results may not be valid and it may not be possible to generalize beyond the subgroup, if this subgroup had not been selected carefully to match the population concerning these critical factors.

Recently, a small annoyance survey was conducted near the maglev line in Shanghai [16]. Such annoyance surveys are not possible in Europe, because the magnetic levitation system has not yet been implemented but for a test facility. Therefore a field experiment was specially designed to solve as many of the above mentioned issues as possible. The experiment differed significantly from the above cited earlier research. A realistic home-like setting was created, in which the panelists were asked to relax while exposed to longer fragments of sound, including quiet periods (Section 2.1). Traffic noise was reproduced in an ecologically valid way, using multiple loudspeakers outdoors to simulate pass-by sound (Section 2.2). The set of panelists was selected to be representative of the Dutch population in factors known to be important modifiers of noise annoyance (Sections 2.3). For the outline of the listening test, menus of train passages delimiting longer exposure durations were used (Section 2.4). The method of master scaling by which perceived annoyance was scaled, calibrated the scales used by different participants to a common master scale (Section 2.5).

## 2. The experiment

### 2.1. Sound reproduction in a realistic setting

As a natural setting, a holiday cottage in Westkapelle (Zeeland, The Netherlands) was selected because of its quiet environment and accessibility. During the experiment, subgroups of participants were seated in the living room, reading a magazine, engaging in light conversation or having something to drink. Figure 1 shows the cottage and its environment. Much attention was paid to creating a realistic reproduction of the three-dimensional indoor sound field, produced by a moving train outside the house. Observe that the goal was to obtain an “ecologically valid” [17, 18, 19] reproduction rather than physical precision, i.e. the methods, materials and setting are aimed at approximating the real-life at-home situation under study. It is difficult to produce the effect of any house by signal processing and playback through headphones or indoor loudspeakers, and to accomplish a natural feeling



Figure 1. Entrance through the garden to the holiday cottage (at the left) where the experiment was performed.

of the sound field. Therefore, it was decided to reproduce the sound field, as recorded outdoors, outside the experimental cottage.

A similar approach has recently been described in [11], where a laboratory test room was modified to mimic a standard living room. Traffic sounds were reproduced from behind a fake window by a 16-channel loudspeaker setup applying the wave field synthesis technique [20]. Our field experiment was conducted in a real living room, with the sound reproduction system installed outside the house in open air. Our setup therefore favors a more realistic and ecologically valid context in exchange for a less accurate sound field reproduction, as compared to [11]. The two-channel recording was, however, accurate enough for producing a realistic three-dimensional representation indoors. Neither approach can, however, completely relate to and account for the participants earlier experiences of noise annoyance in their own natural home environment.

In a small field study, the selected technique for realistic indoor representations of train passages was checked perceptually and acoustically for low speed trains at short distances. In another house situated close to a densely trafficked railway track, the indoor sound fields of real trains and of artificially reproduced train noise were compared. Two loudspeakers placed outdoors were used for reproducing the artificial passages of train noise. The procedure consisted of 2 phases. Firstly, during the passage of a train, the sound was recorded outdoor by 2 B&K 4189 free field microphones separated 20 m from each other along the track; for calibration, the façade level was also recorded. At the same time, a binaural recording was made inside the house. Secondly, the recorded sound was played back by 2 loudspeakers in front of the house, separated about 10 m from each other, and along the same horizontal axis as seen from the window. The volume was adjusted to reproduce the 1/3-octave band spectrum at the façade as accurately as possible. Simultaneously, a binaural recording was again made inside the house. Ideally both binaural recordings (real train and reproduced train) should be equal. For most trains the artificial sound could not be distinguished from

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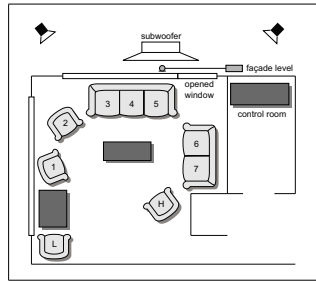


Figure 2. Schematic drawing of the experimental cottage (not to scale). The different seats of the panelists are shown (1–7), as well as the seat of the experimental leader (L) and of an artificial head (H) for binaural recordings.

the real sound by audition. The two spectra were in most 1/3-octave bands within an error of ca. 5 dB; nevertheless it was decided to introduce an equalizer for fine-tuning and a subwoofer for reproducing more accurately the low frequency part of a moving high speed train.

Figure 2 shows a floor plan of the living room and the control room of the experimental cottage, together with the final loudspeaker setup. The sounds were played back on a regular PC equipped with a high quality audio card, located in the control room. The sound signal was then equalized by an Allen & Heath 12-channel mixer and 31-channel equalizer. Subsequently, the sound signal was amplified by a Bose 802II amplifier and fed to 4 Bose loudspeakers, which were placed stacked per 2 on 2 tripod stands at a height of ca. 1.5 m, and to a HK Audio SL218A powered subwoofer on the ground. All loudspeakers were placed outside the house, in front of the main window. The 2 loudspeaker tripods were placed ca. 10 m from each other, perpendicular, at 3 m distance to the façade. The subwoofer was placed in front of the window in between both tripods, at about 50 cm from the façade. This loudspeaker setup was located in front of a slightly opened window of the experimental cottage, invisible to the panelists entering the house.

The façade level was measured continuously during all experimental sessions, using a B&K Investigator 2260 sound level meter with a B&K 4189 free field microphone (5 cm from the window at 75 cm height). The sound level meter was also used to calibrate the playback system. For this calibration, pink noise was played back and adjusted to give a façade level of 91 dB with a flat 1/3-octave band spectrum. The equalizer accomplished a flat ( $\pm 3$  dB for all 1/3-octave bands) spectrum between 30 Hz and 16 kHz. The façade attenuation and the reverberation in the experimental room both modify the spectrum and temporal characteristics of the sound. Since it would not be possible to see a train passage from the window because of plenty of trees, a visual presentation of passing trains was considered not appropriate.

## 2.2. Sample collection and preparation

Two-channel recordings were conducted for three types of trains. Two microphones were placed at 20 m distance from each other along the track, 1.5 m above ground level. TGV trains at high speed were recorded in Belec (Belgium), a site near the TGV connection between Brussels and Lille (France). Dutch intercity (IC) trains of the new type (duplex) were recorded in Oudenbosch near Roosendaal (The Netherlands); at this same site the TGV traveling at low speed from Brussels to Rotterdam was also recorded. At the maglev test track in Lathen (Germany), the Transrapid 08 train was recorded at speeds of approx. 200 km/h, 300 km/h and 400 km/h. For the master scaling references, the sound of the E40 highway was also recorded near Ghent (Belgium). To be able to assess the influence on annoyance of the distance to the track, 4 recording distances were included (25 m, 50 m, 100 m, and 200 m). All recordings were made in free field without noise barriers. Not only the spectrum and temporal change were reproduced exactly, but also the sound level, as if the house would have been located at the measurement site.

From the many train recordings made at each site, the passages of highest quality were selected in each category of recording, and for these, 45-second single passage fragments were cut. It was important to expose the panelists to sufficient and natural durations of noise. Therefore, they had to be exposed to “experimental sound” during at least 10 minutes (henceforth called a menu). To create a realistic exposure situation within a 10-minute menu, it should be composed of the same train type, at the same distance and speed. Menus with 2 or 4 passages were created because 4 passages in 10 minutes already represents the natural time-schedule maximum, and 2 passages in 10 minutes represents a minimum passage rate with inter-passage background sound. Less than two passages are not useful because the inter-event silence is non-defined in this case. Apart from the 45-second fragments recorded at the four distances to the track, a 10-minute highway sound was recorded at 50 m distance to the closest lane.

Table 1 summarizes the sound exposure (ASEL) and sound levels ( $L_{Aeq,45s}$ ) associated with the 45-second passages used in the 10-minute menus. It should be mentioned that the level of the IC train at 25 m happens to be lower than the level at 50 m. This inconsistency is due to the fact that the selected high-quality sound fragments do not necessarily originate from identical train passages. There is always a natural spread in the speed and the number of wagons of the different passages of the same type of train. As an illustration, Figures 3 and 4 show the A-weighted sound exposure level in 1/3-octave bands for some of the experimental traffic sounds, as recorded in free field.

For master scaling, 7 traffic-noise-like reference sound fragments of 45 seconds duration, with sound pressure

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Table 1. Sound exposure levels (ASEL) for one 45-second train passage, sound level ( $L_{Aeq,45s}$ ) of one 45-second train passage and of highway traffic, and sound level ( $L_{Aeq,10min}$ ) of the 10-minute menus of the experiment, at 25 m to 200 m distance to track or route (all free field recordings). The train noise  $L_{Aeq,10min}$  values are given for the 2-train menu; to obtain the  $L_{Aeq,10min}$  values for the corresponding 4-train menu, add 3 dB.

Sound source		Outdoor ASEL [dB(A)]				Outdoor $L_{Aeq,45s}$ [dB(A)]				Outdoor $L_{Aeq,10min}$ [dB(A)]			
		25 m	50 m	100 m	200 m	25 m	50 m	100 m	200 m	25 m	50 m	100 m	200 m
Maglev	200 km/h	80.1	72.9	71.3	59.7	63.6	56.4	54.8	43.2	55.3	48.1	46.5	34.9
	300 km/h	86.3	83.0	80.3	69.6	69.8	66.5	63.8	53.1	61.5	58.2	55.5	44.8
	400 km/h	92.6	88.7	85.2	70.4	76.1	72.2	68.7	53.9	67.8	63.9	60.4	45.6
TGV	140 km/h	84.1	78.3	73.6	64.4	67.6	61.8	57.1	47.9	59.3	53.5	48.8	39.6
	300 km/h	92.8	90.6	86.9	83.0	76.3	74.1	70.4	66.5	68.0	65.8	62.1	58.2
	140 km/h	75.0	80.9	72.4	62.0	58.5	64.4	55.9	45.5	50.2	56.1	47.6	37.2
Highway	free flow	—	—	—	—	71.6	66.1	62.6	55.3	—	65.3	—	—

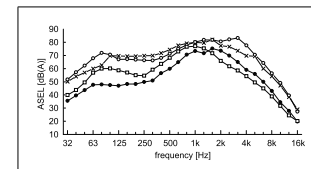


Figure 3. Sound exposure level (ASEL) in 1/3-octave bands of four different types of traffic sounds, all recorded during 45 seconds in free field at a distance of 50 m to the track (or highway route): (X) a passage of a maglev train traveling at 400 km/h, (O) a passage of a TGV traveling at 300 km/h, (●) a passage of an IC train traveling at 140 km/h and (□) a highway with free flow traffic.

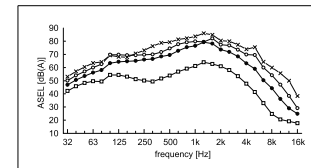


Figure 4. Sound exposure level (ASEL) in 1/3-octave bands of a maglev train traveling at 400 km/h, recorded during 45 seconds in free field at various distances to the track: (X) 25 m, (O) 50 m, (●) 100 m and (□) 200 m.

level spanning the whole experimental range, were included in the experiment. A 45-second fragment of the highway noise recorded at 50 m distance to the highway was used as the centre reference sound. A filter which attenuates the sound at frequencies below 500 Hz by 3 dB and above 500 Hz by 6 dB was applied 3 times to produce 3 reference sounds with varying level, all below the level of the centre reference sound, giving the impression that

the source is further away. In the same way, a filter that amplifies the sound at frequencies below 500 Hz by 3 dB and above 500 Hz by 6 dB was used to generate 3 reference sounds with varying level higher than the level of the centre reference sound.

## 2.3. Selection of a representative panel

In contrast to previous experimental work on noise annoyance caused by high speed trains, in which small “convenient” samples of test persons were recruited, the selection of panelists was here made to guarantee a representative sample of panelists. A questionnaire was administered at the doorstep of the homes of approximately 1500 persons, all living within a distance of 15 km from the experimental site. In an introductory letter, one inhabitant of the house was invited to participate in the study. The prerequisites were that (s)he had to fill in and send the questionnaire back to the address on the enclosed stamped envelope. A compensation of €100 was offered for participation.

The questionnaire contained selected questions that had been asked to a representative sample of the target population in a recent survey. The structure of the Dutch population was inferred to be representative from a recent RIVM survey [21] and partly from a Eurobarometer questionnaire. Our questionnaire contained (standard) questions on environmental noise as regards perception, annoyance and sleep disturbance. Included were evaluations of the quality of the neighbourhood in terms of housing and environmental pollution of other types than noise, as well as evaluations of overall satisfaction with the current living situation. Other questions addressed basic demographic variables such as age, gender, education, housing, family size and work arrangements. A set of questions were also included on general and mental health, hearing ability, environmental background, opinion and worry, and environmental sensitivity.

A procedure to draw panelists, representative of the target population, from the 255 replies received involved three stages. Stage 1 removed potential panelists on the basis of their age and hearing ability (information had already been given in the introductory letter). Stage 2 further removed those that were very dissimilar from the typical

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Table II. Comparison between the panelists and the reference population on various criteria. Mean and standard deviation is shown; the results for the second series of criteria are on an 11-point scale and vary from 0 (not at all / bad) to 10 (very / good).

Criterion	Participants	Reference
Gender [% male / % female]	51 / 49	48 / 52
Age [year]	45.1 ± 13.4	45.6 ± 17.7
Noise sensitivity	5.1 ± 2.4	4.6 ± 2.6
Quality of traffic noise in the living environment	6.6 ± 2.4	6.4 ± 2.3
Quality of the living environment	7.6 ± 1.4	7.3 ± 1.3
Feeling afraid or frightened	2.4 ± 2.0	2.3 ± 2.1

Dutch person on the basis of binary coding of most of the other criteria included in the questionnaire. This stage implicitly assessed individual responses on the questions as regards their concordance with the response profile of the typical Dutch person in the reference survey. Stage 3 finally selected panelists on the basis of fuzzy resemblance to the typical Dutch person on the most critical criteria of annoyance surveys, such as age, gender, education, noise sensitivity, feeling afraid or frightened, hearing train noise at home, quality of traffic noise in the living environment, quality of the living environment, general health, and illness. Finally, ca. 100 representative participants were selected. Table II shows a comparison of the panelists with the Dutch target population as regards the mean and standard deviation of some of the selection criteria used and mentioned above.

#### 2.4. Listening test outline

Four to six panelists jointly participated in a session. The overall structure and time schedule of the listening experiment was identical for each group of panelists. It started with a 14-minute training session, during which the panelists were asked to scale each of the 7 reference (highway) sounds two times (in random order). Thereafter, 7 10-minute menus were played, of which the first menu always was the highway traffic menu. A short break was then taken and the training session was repeated, after which again 7 new 10-minute menus were played. After this experiment with menus, a more conventional psychoacoustical listening test was conducted, in which the panelists had to scale 45-second excerpts of all transport noise stimuli used in the menu experiment. The duration of an experimental session was on average about 4 hours. To illustrate how the listening test was performed, Figure 5 shows the sound level in dB(A), rerecorded in front of the façade, during one of the panelist groups' listening experiment.

In all, two times 6 train menus were presented to each panelist. It was decided that, within one set of 6 train menus, conventional trains (IC or high-speed) should not be mixed with magnetic levitation trains. By this separa-

tion, it was possible to include a retrospective evaluation over the last hour as well. From previous experience it was known that the order of the menu presentations might affect the results. Half of the panelists were therefore presented the maglev train sounds first, the other half the conventional trains first. A singular session consisted of the same number of passages inside the menus. This avoids that panelists would concentrate on counting events. Finally, since one distance to the track would create a natural setting, large distances were never mixed with short distances in the menus of a session.

During the experimental sessions, perceived noise annoyance of all transport noises was scaled with the method of free-number magnitude estimation [22]. The panelists were asked to write down their magnitude assessments on different coloured pieces of paper. Before the start of the experiment, the panelists were instructed to select an appropriate number and then to double this number if they found the next stimulus to be twice as annoying, to make the number three times larger if they found the next stimulus to be three times as annoying etc., and to scale 0 if they considered it not to be annoying at all. For each 45-second sound (training sessions and conventional listening test), a conditional question was included: "To what extent would you be annoyed by this traffic sound, if you heard it while relaxing?". For each 10-minute menu during the previous period?". In these latter questions, we explicitly did not want to refer to train noise, since we wanted the panelists to decide themselves whether the sound period they last heard sounded like train-contaminated or not.

#### 2.5. Master scaling

In all experimental sessions, the 7 road-traffic-noise-like reference sounds helped the panelists to define their own scaling context. The annoyance values given to these reference sounds made it possible to control for the individual panelists' choice-of-number behaviour in scaling the target train sounds. It would also control the influence of personal factors such as noise sensitivity. To get rid of these effects, each individual panelist's annoyance scale was calibrated by the aid of the reference to the common master scale [23].

A graphical illustration of the master scale transformation applied to the annoyance reference data of one of the panelists is given in Figure 6. The average annoyance reported for each of the 7 reference sound levels of road traffic noise is plotted in lin-log coordinates against their sound levels,  $L_{Aeq,45s}$ , measured at the façade. Individual psychophysical functions are fitted to the reference data (open circles). They are of the form

$$A_r = a + b \log S_r, \quad (1)$$

where  $A_r$  is the reported annoyance during the training session, and  $\log S_r$  is the corresponding "road traffic noise" reference ( $r$ ) sound level in dB(A). The constants  $a$

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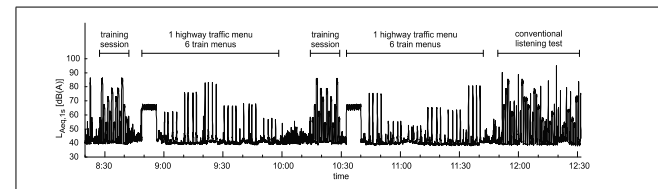


Figure 5. Sound pressure level rerecorded in front of the façade during one panelist groups' participation in the whole listening test: two training sessions, two menu sessions and one conventional psychoacoustical experiment with references.

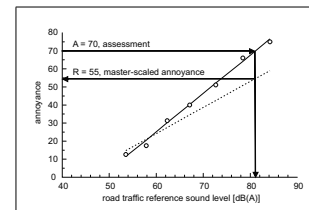


Figure 6. Calculation of master-scaled annoyance, using one panelist's empirical psychophysical function of the reference sounds (data points with solid line) and the master function for the same sounds (dashed line; obtained as average function for all panelists).

and  $b$  will be different for each panelist and will depend on their choice-of-number behaviour in the particular scaling context. The empirically derived master functions for the group of 100 panelists (dashed line in Figure 6) were then used to transform the free number magnitude estimations of the train or road traffic menus for each individual,  $A_r$ , to the corresponding annoyance values  $R$  in master scale units,

$$R = -62.9 + 1.45 \frac{A_r - a}{b}. \quad (2)$$

The slope of the master function was set to 1.45, which is the average slope of all the individual psychophysical functions, whereas the intercept was set to produce a value of "zero" for the most quiet train menu. The reason for the latter choice was that a majority of the panelists (84%) reported their annoyance to be zero for this menu, and a majority of the panelists reported annoyance to be greater than zero for all other menus.

The choice of a logarithmic psychophysical function (equation 1) was a compromise. In previous magnitude estimation experiments of loudness [23, 9], a power function of the form  $\log A = c + d \log S$  was found to fit the

Table III. Test-retest reliability of panelists' perceived noise annoyance of the 7 reference road traffic sounds. Each cell contains an arithmetic mean of Pearson's coefficient ( $r$ ) and its standard error. Ts1: Training session 1, Ts2: Training session 2, Ct: Conventional test.

	Ts1		Ts2		Ct
	Set 1	Set 2	Set 1	Set 2	Set 1
Ts2/2	0.82 ±0.015				
Ts2/1	0.86 ±0.014	0.87 ±0.016			
Ts2/2	0.86 ±0.017	0.88 ±0.020	0.87 ±0.019		
Cv/1	0.83 ±0.015	0.83 ±0.021	0.82 ±0.019	0.85 ±0.020	
Cv/2	0.84 ±0.015	0.85 ±0.019	0.81 ±0.016	0.84 ±0.019	0.82 ±0.015

empirical data best. However, in this experiment noise annoyance, rather than loudness, was scaled and thus, obviously, also a value of zero (= not at all annoyed) had to be handled, although the noise was heard and its loudness was above zero. The power function (after removal of zeros) did not fit the data better than the chosen logarithmic function.

#### 2.6. Data quality analysis

The master scaling made it possible to investigate the quality of the experimental data in two ways, as panelists' test-retest reliability and as their scaling ability. The 7 reference sounds were presented 6 times to each panelist; twice in the two training sessions and twice in the last conventional listening test. The set of 6 reference scale values were used to determine each panelist's test-retest reliability of annoyance. Table III shows the Pearson's coefficient of correlation for these 6 annoyance scales, averaged over all panelists. The test-retest reliability was very good, between 0.81 and 0.88, and the standard error was low, between 0.014 and 0.019.

The deviation from the proposed master function (equation 1) was used to assess the data quality and annoyance

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Table IV. Distribution of constants of the panelists' individual psychophysical functions (Eq. 1). The number of data sets refers to the average of 4 or 2 raw annoyance values, which was taken for each of the 7 reference sounds to calculate the psychophysical functions.

	Data Sets	Psychophysical function	$r^2$	$a$	$b$
Training session 1&2	4		0.947	-67.27	1.449
			$\pm 0.077$	$\pm 61.28$	$\pm 1.230$
Conventional test	2		0.881	-47.57	1.105
			$\pm 0.118$	$\pm 48.17$	$\pm 0.948$

scaling ability for each panelist and to trace errors and inaccuracies. Table IV shows the distribution of constants of the panelists' individual psychophysical functions (equation 1). The average annoyance variance explained by sound level ( $L_{Aeq,45s}$ ) of the reference road traffic sounds was found to range from 88 % to 95 %. All panelists were able to produce acceptable individual logarithmic functions of annoyance as a function of sound level to the reference. They have thus produced acceptable annoyance data in order to transform these to a common master scale of annoyance; no panelists were excluded from further data analysis.

### 3. Results

The main listening experiment with menus differed from previous laboratory experiments in a number of aspects. One important novelty is that participants were asked to judge annoyance over a longer period of time — Fastl and Gottschling's experiment [4] forms an exception. During the 10-minute periods, the panelists were engaged in low attention, relaxing activities such as reading a magazine, making a conversation or having something to drink. In order to find out how this new approach affected the results, a subsequent experiment was included, which was more comparable to earlier experiments on train noise (e.g. [8]).

#### 3.1. Main field experiment with 10-minute menus

The panelists' master scale values of annoyance were averaged for each menu in the field experiment. A stepwise multiple linear regression analysis was performed, with average master scaled annoyance as dependent variable and (a) time averaged A-weighted façade exposure  $L_{Aeq,10min}$ , (b) distance to the source (logarithmic) and (c) source type, as independent variables. Because of its legislative importance in the Netherlands, the façade exposure was preferred to the actual panelists' noise exposure. Façade exposure was calculated from the sound levels measured on the recording sites, since the façade levels measured during the experiment also contain noise from wind and rain. It has to be noted that the actual sound exposure levels experienced by panelists participating in a single experimental session may differ, because of different seating positions. However, personal characteristics, such as noise sensitivity, will have a much larger influence

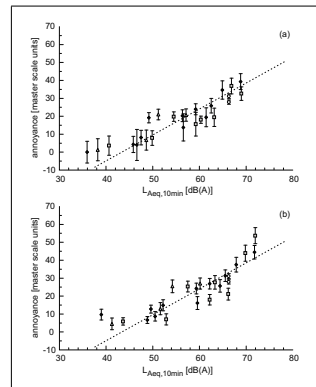


Figure 7. Average master scaled annoyance of the menus versus  $L_{Aeq,10min}$  (a) for 2 events per 10-minute menu and (b) for 4 events per 10-minute menu, for different types of train sounds: (Δ) IC train, (□) TGV and (◆) maglev train. In comparison, the annoyance for the highway traffic (○) is also shown. Standard error on means is indicated, as well as the master function (dashed line).

on perceived annoyance, as compared to the influence of a slightly different exposure.

Table V summarizes the results. In the first model, sound level was the only independent variable; this model explained 80 % of the variance in annoyance. In the second model, distance to track was added to sound level as an independent variable; this model increased the variance explained to 85 % (F-change = 14.49;  $df_1 = 1$ ;  $df_2 = 46$ ;  $p < 0.001$ ). Thus, distance to source explained a significant additional part of the annoyance variance not accounted for by sound level. In the third model, source type was included as a third independent variable along with sound level and distance. Source type was defined on a nominal scale: MAGLEV, TGV, IC and HIGHWAY. It was introduced in the analysis as three dummy variables, coded 0 and 1 (the highway noise source type corresponds to the case that these variables are all zero). The inclusion of source type did not increase significantly (F-change < 1.0) the proportion of variance explained. This suggests that statistically, there is no additional contribution of source type on perceived annoyance over and above the effects of sound level and distance. It can therefore be concluded that magnetic-levitation based transportation systems are not significantly more annoying than conventional rail based systems (same façade  $L_{Aeq}$  and same distance are prerequisites). Moreover, railway noise was not found to be

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Table V. Stepwise multiple regression analysis of acoustic variables on perceived annoyance of train and highway traffic sounds, for the main field experiment with 10-minute menus. The Pearson's correlation coefficients of the variables entered in the regression analysis are shown at the bottom. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Model	Model fit ( $r^2$ )	Model fit increase ( $r^2$ -change)	F-change	Independent Variables	Coefficient	t-value
1.	0.80	0.80	187.48***	$L_{Aeq,10min}$ [dB(A)]	1.18	13.69***
2.	0.85	0.05	14.49***	$L_{Aeq,10min}$ [dB(A)] $\log_{10}(\text{distance [m]})$	0.92 -10.74	9.17*** -3.81***
3.	0.85	0.00	0.13	$L_{Aeq,10min}$ [dB(A)] $\log_{10}(\text{distance [m]})$ MAGLEV [0,1] TGV [0,1] IC [0,1]	0.96 -10.17 1.45 0.85 2.27	8.22*** -3.33*** 0.27 0.16 0.40
Label	Variable	ANN	LEQ	DIST	MAG	TGV
ANN	Annoyance [master scale]					
LEQ	$L_{Aeq,10min}$ [dB(A)]	0.894				
DIST	$\log_{10}(\text{distance [m]})$	-0.754	-0.659			
MAG	MAGLEV [0,1]	-0.023	-0.038	0.009		
TGV	TGV [0,1]	0.132	0.224	0.006	-0.682	
IC	IC [0,1]	-0.179	-0.290	0.004	-0.433	-0.308

systematically less annoying than highway traffic noise. This means that no support for a railway bonus was found in this experiment; at least it was not as obvious that it could be observed using linear statistics. Figure 7 gives an overview of the annoyance functions for the 10-minute menus as a function of  $L_{Aeq,10min}$ . The dashed line indicates the master function of annoyance for the road-traffic-like sounds used as references.

The shorter rise time of the noise of arriving high speed trains may create more annoyance than a conventional train can do. Figure 8, Panel a, shows the rise speeds in dB(A)/s in proportion to circle sizes. These values were calculated for all sound events included in this experiment by fitting a straight line through the initial increase in sound level. The accelerating growth of annoyance with increasing  $L_{Aeq}$  may be explained by the rise time. In Figure 8, Panel b, the size of the circles is instead proportional to the distance to the track. For  $L_{Aeq}$  in the interval between 50 and 65 dB(A), annoyance is clearly lower for train passages at larger distances than for train passages at closer distances or road traffic noise (dashed line). This could indicate that a possible noise annoyance bonus for train noise would only hold at larger distances from the track, and only in the latter  $L_{Aeq}$  interval.

#### 3.2. Conventional listening test

In the conventional listening experiment, the sounds were presented as short 45-second fragments containing the sound of one train passage and highway excerpts. Figure 9 shows the results of these master scaled annoyance values as a function of time averaged A-weighted façade exposure,  $L_{Aeq,45s}$ . A railway penalty can be observed, both in regard to the artificial reference sounds as well as to

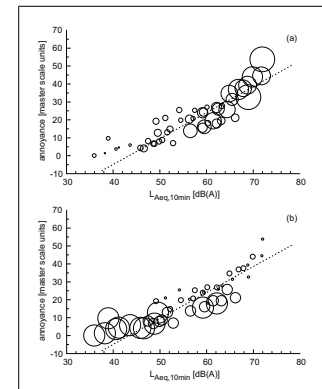


Figure 8. Average master scaled annoyance of the menus versus  $L_{Aeq,10min}$  showing (a) the noise event rise speed and (b) the distance to the track as the size of the circles. The master function is also indicated (dashed line).

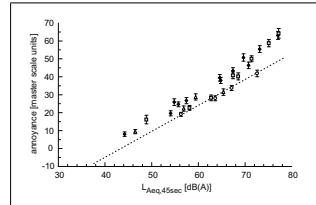
the highway sounds. Figure 10 shows the annoyance as a function of rise speed (Panel a) and distance to the track (Panel b).

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ACTA ACUSTICA UNITED WITH ACUSTICA  
Vol. 93 (2007)Table VI. Stepwise multiple regression analysis of acoustic variables on perceived annoyance of train sounds (no highway traffic sounds), for the conventional listening test (45-second passages). The Pearson's correlation coefficients of the variables entered in the regression analysis are shown at the bottom. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Model	Model fit ( $r^2$ )	Model fit increase ( $r^2$ -change)	F-change	Independent Variables	Coefficient	t-value	
1.	0.95	0.95	420.17***	$L_{Aeq,45s}$ [dB(A)]	1.67	20.50***	
2.	0.98	0.03	12.50***	$L_{Aeq,45s}$ [dB(A)]	1.23	11.04***	
				Speed [km/h]	0.02	2.03	
				$\log_{10}$ (distance [m])	-1.78	-0.77	
				Rise speed [dB(A)/s]	0.63	3.65**	
3.	0.99	0.01	0.98	$L_{Aeq,45s}$ [dB(A)]	1.08	6.85***	
				Speed [km/h]	0.03	2.09	
				$\log_{10}$ (distance [m])	-4.76	-1.46	
				Rise speed [dB(A)/s]	0.58	3.30**	
				MAGLEV [0,1]	-0.70	-0.37	
				TGV [0,1]	1.66	1.04	
Label	Variable	ANN	LEQ	SPD	DIST	RISE	MAG
ANN	Annoyance [master scale]						
LEQ	$L_{Aeq,45s}$ [dB(A)]	0.975					
SPD	Speed [km/h]	0.646	0.541				
DIST	$\log_{10}$ (distance [m])	-0.613	-0.667	-0.001			
RISE	Rise speed [dB(A)/s]	0.885	0.804	0.708	-0.437		
MAG	MAGLEV [0,1]	0.070	-0.017	0.552	0.000	0.188	
TGV	TGV [0,1]	0.207	0.246	-0.190	0.000	0.100	-0.707

Figure 9. Average master scaled annoyance versus  $L_{Aeq,45s}$  for the conventional listening test, for different types of train sounds: (▲) IC train, (■) TGV and (●) maglev train. In comparison, the annoyance for the highway traffic (○) is also shown. Standard error on means is indicated, as well as the master function (dashed line).

A stepwise multiple linear regression analysis was also performed separately for the train noises (Table VI). The first model, in which sound level  $L_{Aeq,45s}$  was included as the only independent variable, explained 95 % of the variance in annoyance. In the second model, train speed, distance to the track and rise speed were added to sound level as independent variables. This increased the variance explained to 98 % (F-change = 12.50,  $df_1 = 3$ ;  $df_2 = 19$ ;  $p < 0.001$ ). Apart from sound level, also rise speed con-

tributed significantly to the variance explained. The third model, in which train type was added as an independent dummy variable, did not significantly increase the proportion explained variance (F-change < 1.0). These results suggest that, in this conventional listening test, there is no difference in perceived annoyance between different types of trains, over and above the effect of sound level and rise speed.

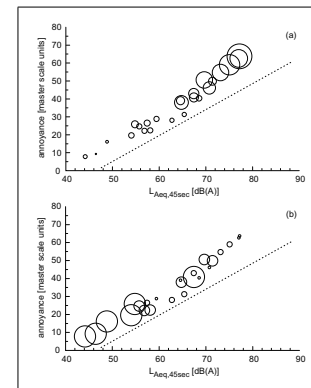
One has to note that the number of responses to each stimulus was smaller in the main experiment (10-minute menus) than in the conventional listening test (45-second passages). This explains why the standard errors are lower and the explained variance is higher in the latter experiment.

#### 4. Discussion

The annoyance results of the present field experiment are close to residents' everyday reality, although comparison with published studies is somewhat limited. Previous laboratory experiments on noise annoyance of conventional IC and high-speed trains, specifically magnetic levitation trains [8, 5], report significant differences for these types of sound. In particular, the results have shown that for the same  $L_{Aeq}$ , high-speed trains were more annoying than other trains. Compared to road traffic noise, the cited studies claimed a lower annoyance level for conventional trains. In the present field experiment, we did not find support for any annoyance difference between various types

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Figure 10. Average master scaled annoyance versus  $L_{Aeq,45s}$  showing (a) the noise event rise speed and (b) the distance to the track as the size of the circles. The master function is also indicated (dashed line).

of trains and road traffic. Some possible explanations will be given in the following subsections.

#### 4.1. Realistic listening situation with 10-minute menus

The experiment was performed in a realistic setting, in which outdoor transportation noise was reproduced, and natural outdoor-to-indoor sound propagation characteristics were utilized (slightly open window). This setting provided a realistic sound environment indoors. Subgroups of panelists were kept indoors during the four-hour experiments, and upon request, annoyance to transport noise was reported with reference to 10-minute periods.

Because trains run on expected schedules to which people habituate, the experimental situation in classical experiments is rather unrealistic. The experimental one-passing situation [8] requires full attention and will have a large variation of train sounds, compared with a particular railway track. The outcome will to a large extent depend on the experimental context, that is, the variation introduced in the experiment by selecting stimuli and using random presentation orders. Random orders of recordings can be selected and arranged so that annoyance judgments on category scales plotted against sound level differentiate well or not well on type of transport. In the present field experiment, sub-context in sessions was kept invariant, similar to the situation on a real railway track. The judgmental con-

text will then be much more restricted, as is the case when living along one railway track.

Next to this, the annoyance reports of the one 45-second train passage were higher than those of two passages of the same train within the 10-minute menus. This is all in order, because the two types of annoyance were master scaled in order to become comparable over experimental sessions. When judging 45-second train passages immediately after exposure, it is quiet clear that the task is to assess the annoyance of that particular train passage (or other sounds that were presented). However, when asked to assess the annoyance, retrospectively, of the transport noise during the last 10-minute menu (e.g. two train passages), the panelist will have to choose a strategy on how to go about this. For example, the annoyance may only be referred to the two noise-stimulus periods, or to the whole 10-minute period (menu). It has been shown that the noise annoyance of two overlapping (equal) noises would be expected always to be less than the arithmetic sum of the two annoyances (for a review, see [24]). It is more uncertain how total annoyance of two train passages separated in time will actually be acquired. A laboratory experiment, which included long sound fragments [4], has not found the above-mentioned annoyance difference between different train types, which is in line with our results.

#### 4.2. Advanced scaling methodology

Long-term retrospective annoyance asked for in questionnaire surveys has typically been assessed on category scales (e.g. [3]). A response category is then implicitly postulated to be identical for every participant, by verbal labeling of the two end points or of every response box; also the intervals between categories are assumed to be the same. However, this assumption does not hold true [25]; e.g. in questionnaire surveys, the response criteria (scale value or category borders) for annoyance are much higher for respondents in low noise areas as compared to those in highly exposed areas. The most well known scaling bias in laboratory experiments is the context effect in which participants distribute their responses over the "full" range of categories, independent of the size of the exposure range (for a review, see [22]). In the process of using category scales, floor and ceiling effects on annoyance may also appear.

To avoid uncontrolled context effects an invariant sound level range of references was used as the annoyance context in the present field experiment. Continuous road traffic noise was chosen as a reference instead of multiple event sounds, because it is simpler to reproduce in future studies. To avoid the scaling bias of category scales the method of magnitude estimation was chosen, in which participants were free to use the range of numbers they felt comfortable with. Master scaling was applied to these individual annoyance estimates, involving a transformation function to a common master scale defined by the references, which sound levels defined the scaling context. In theory, this master scale transformation will calibrate the loudness-dependence of noise annoyance, whereas the relative con-

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tribution to noise annoyance from qualitative content (e.g. the type of sound, the time pattern and cues for speed and distance) will hopefully be unchanged.

Earlier research has shown that master scaling with references works well for loudness or annoyance of a one-occasion target exposure, that is, when repeated exposure is unfeasible (e.g. experiments with long duration exposures) or impossible (e.g. questionnaire surveys in field studies); an example can be found in [23]. The results obtained from the present field experiment are probably more reliable than the results that would have been obtained by category scaling. The test-retest reliability of the panelists' magnitude estimates of annoyance of the reference sounds was found to be very good (above 0.8) compared to the reliability of 0.72 obtained in [8] for a group of 12 much younger subjects. Considering that our panelists all were naïve participants, they also each produced high quality psychophysical functions for the reference, as discussed in Section 2.6.

#### 4.3. Other possible explanations

There are several reasons why other investigators have found a railway bonus (for a review, see [3]), which was not found in this field experiment. One of the reasons for finding a railway bonus for short (one minute) noises in listening experiments, may be that the relation between loudness and  $L_{Aeq}$  is inherently different for train and road traffic noise. Indeed, some researchers have argued that noise annoyance evaluation in listening tests of short sounds actually is close to a perceptual loudness evaluation (however, see [26] on differences between loudness-based and quality-based perceived annoyance). If Zwicker loudness is a good first estimate of perceptual loudness, the difference between train noise (of different types) and highway noise would be seen in a Zwicker loudness versus  $L_{Aeq}$  plot (Figure 11). Because the IC train noise used in the present experiment was the noise of modern, rather quiet trains, a few older and noisier IC train models were added in this acoustic analysis. At levels above 65 dB(A), TGV and maglev trains seem to be a little louder than highway traffic or older IC trains. However, this effect on Zwicker loudness is not significant and does therefore not support a railway bonus of 5 dB(A), stipulated in several countries' legislation. Rather, it seems to be a good action to start to replace old IC trains by new ones. The railway bonus was originally based on studies with rather old low-speed trains, and with much less dense traffic intensity than nowadays.

The intermittent character of railway noise could also be an explanation for the railway bonus. However, this does not hold for aircraft noise, which is also intermittent; this can be explained by a difference in exposure. In the case of aircraft noise, the exposure is on top of buildings and on all façades. In the case of road traffic noise, the probability is high that there are local roads also, but there is a possibility for a "quiet side"; people are less annoyed if quiet sides are available [27]. In the case of railway noise, there is a low probability for the presence of more than one track,

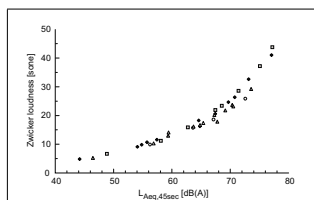


Figure 11. Zwicker loudness versus  $L_{Aeq,45s}$  for different types of transportation sounds: ( $\Delta$ ) IC train, ( $\diamond$ ) maglev train, ( $\circ$ ) highway traffic and ( $\square$ ) some additional noisier IC trains (older type).

so the exposure will also be directed at only one façade. In comparing road traffic and trains, the façade insulation will be more effective in the case of train noise, because of the smaller low-frequency proportion associated to train noise. In comparing aircraft and trains, which are both intermittent, the indoor exposure is certainly more intensive for aircraft. Considering these arguments, it seems obvious that aircraft is more annoying than road traffic, which is more annoying than train. However, façade reduction was taken into account in the present field experiment, and still there was no clear railway bonus found. Compared with the field condition with closed windows, and the façade filter used in [8], a partially open window was used in the present field experiment, which could explain this.

In surveys questioning people at their home, a lower reported annoyance for train noise compared to highway traffic noise was observed in a particular range of noise levels. Most of the possible explanations proposed in literature conflict with the fact that this railway bonus would be observed in experiments based on single passages. We mention just a few. The typical character of train noise and the concentration of the sound energy in short time intervals may be advantageous with regard to activity disturbance. If the level is sufficiently low, the probability of noticing the train noise is small compared to the probability of noticing the sound of a continuous source. In addition to physical differences in the sound, the "green image" of trains as a means of transportation may add to the acceptability of the source and thus increase the tolerance to its noise, that is as long as train passages are not too frequent. However, a more recent hedonic pricing study found that householders in Birmingham place a greater value on reductions in railway noise than in road traffic noise [28]. Cross-cultural studies (in field and laboratory context) have shown that a railway bonus is not universal [29, 30], which would favor the argument above. It has further been shown that the bonus varies depending on the (multiple) exposure situation [31]. Based on the above, only part of the effect is supposed to be visible in

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field experiments such as the one reported of in this paper. Part of the effect is precisely what is observed.

#### 5. Conclusion

This study has shown that in an "at home" like context, noise annoyance caused by different types of trains at the same average outdoor façade exposure level is not significantly different. In particular, magnetic levitation systems are not more annoying than conventional high speed trains, which is in agreement with earlier research. Noise annoyance caused by conventional trains was not found to be significantly lower than annoyance caused by TGV's or maglev trains at the same average façade exposure. Field surveys have shown that for the same average sound level, railway noise causes less annoyance or highly annoyed persons than highway traffic noise. Although our field experiment included several factors that may contribute to this effect, we could not observe it.

More insight may be gained by taking into account the psychoacoustic characteristics of the noise exposure and the relevant personal factors of the panelists. This paper has focused on discussing the experimental methodology in great detail, and on presenting the results as a function of the average outdoor façade exposure level, since this is the main noise legislation indicator used in the Netherlands. Results of a detailed psychoacoustic analysis will be reported in a future paper.

#### Acknowledgments

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#### References

- [1] J. M. Fields, J. G. Walker: Comparing the relationships between noise level and annoyance in different surveys: a railway vs. aircraft and road traffic comparison. *J. Sound Vib.* **81** (1982) 51–80.
- [2] U. Moeller: Community response to railway noise: A review of social surveys. *J. Sound Vib.* **120** (1988) 321–332.
- [3] H. M. E. Miedema, H. Vos: Exposure-response relationships for transportation noise. *J. Acoust. Soc. Am.* **104** (1998) 3432–3445.
- [4] H. Fastl, G. Gottschling: Subjective evaluation of noise immissions from transrapid. Proceedings of the 25th International Congress on Noise Control Engineering (Inter-noise), Liverpool, UK, July 1996, F. A. Hill, R. Lawrence (eds.).
- [5] D. Neugebauer, J. Ortscheid: Geräuschbewertung des Transrapid: Ist der Transrapid wie die Bahn zu beurteilen? Berlin Umweltbundesamt, Texte 25, 1997.

De Coensel et al.: Annoyance caused by high-speed trains

- [6] D. Neugebauer, J. Ortscheid: Geräuschbewertung des Transrapid. Fortschritte der Akustik — DAGA 97, Kiel, Germany, 1997.
- [7] J. Vos: Annoyance caused by magnetic levitation train Transrapid 08 — a laboratory study. TNO report TM-03-C001. The Netherlands Organisation for Applied Scientific Research (TNO), Soesterberg, The Netherlands, Jan. 2003.
- [8] J. Vos: Annoyance caused by the sounds of a magnetic levitation train. *J. Acoust. Soc. Am.* **115** (2004) 1597–1608.
- [9] B. Berglund, A. Preis: Is perceived annoyance more subjective-dependent than perceived loudness? *Acta Acustica united with Acustica* **83** (1997) 313–319.
- [10] M. Ishibashi, K. Ueno, H. Tachibana, M. Watanabe: Subjective experiment on annoying sounds in living environments. Proceedings of the 18th International Congress on Acoustics (ICA), Kyoto, Japan, 2004.
- [11] J. Maillard, J. Martin, P. Champelovier, J. Lambert: Perceptive evaluation of road traffic noise inside buildings using a combined image and wave field synthesis system. Proceedings of CFA/DAGA'04, Strasbourg, France, März 2004.
- [12] R. F. S. Job: Community response to noise: A review of factors influencing the relationship between noise exposure and reaction. *J. Acoust. Soc. Am.* **83** (1988) 991–1001.
- [13] H. M. E. Miedema, H. Vos: Demographic and attitudinal factors that modify annoyance from transportation noise. *J. Acoust. Soc. Am.* **105** (1999) 3336–3344.
- [14] W. Ellermeier, M. Eigenstetter, K. Zimmer: Psychoacoustic correlates of individual noise sensitivity. *J. Acoust. Soc. Am.* **109** (2001) 1464–1473.
- [15] D. Västfjäll, M. Kleiner, T. Gärling: Affective reactions to interior aircraft sounds. *Acta Acustica united with Acustica* **89** (2003) 693–701.
- [16] T. Feng, C. Xiao-hong, L. Tan-feng: A social survey on the effects of high-speed maglev noise on residents in Shanghai. Proceedings of The 2005 Congress and Exposition on Noise Control Engineering (Inter-noise), Rio de Janeiro, Brazil, Aug. 2005.
- [17] J. J. Gibson: The ecological approach to visual perception. Lawrence Erlbaum Associates, Inc., Hillsdale, New Jersey, USA, 1979.
- [18] J. G. Neuhoff: Ecological psychoacoustics: Introduction and history. — In: Ecological Psychoacoustics, J. G. Neuhoff (ed.). Elsevier Academic Press, London, UK, 2004.
- [19] C. Guastavino, B. F. G. Katz, J.-D. Polack, D. J. Levitt, D. Dubois: Ecological validity of soundscape reproduction. *Acta Acustica united with Acustica* **91** (2005) 333–341.
- [20] A. J. Berkhout, D. de Vries, P. Vogel: Acoustic control by wave field synthesis. *J. Acoust. Soc. Am.* **93** (1993) 2764–2778.
- [21] E. A. M. Franssen, J. E. F. van Dongen, J. M. H. Ruysbroek, H. Vos, R. K. Stellato: Hinder door milieufactoren en de beoordeling van de leefomgeving in Nederland. Inventarisatie verstoringen 2003. RIVM report 815120 001, National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands, 2004.
- [22] L. E. Marks, D. Algom: Psychophysical scaling. — In: Measurement, Judgment and Decision Making, M. H. Birnbaum (ed.). Academic Press, New York, 1998.
- [23] B. Berglund: Quality assurance in environmental psychophysics. — In: Ratio Scaling of Psychological Magnitudes - In Honor of the Memory of S. S. Stevens, S. J. Bolanowski, G. A. Gescheider (eds.). Erlbaum, Hillsdale N. J., 1991.

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- [24] M. Nilsson, B. Berglund: Effects of noise from combinations of traffic sources. Archives of the Center for Sensory Research **6** (2001) 1–59.
- [25] B. Berglund, U. Berglund, T. Lindvall: A study of response criteria in populations exposed to aircraft noise. J. Sound Vib. **41** (1975) 33–39.
- [26] B. Berglund: The role of loudness as guide for community noise. Proceedings of the 20th International Congress on Noise Control Engineering (Inter-noise), Sydney, Australia, 1991.
- [27] E. Öhrström, A. Skånberg, H. Svensson, A. Gidlöf-Gunnarsson: Effects of road traffic noise and the benefit of access to quietness. J. Sound Vib. **295** (2006) 40–59.
- [28] I. J. Bateman, B. H. Day, L. L.: The valuation of transport-related noise in Birmingham. Technical Report Department of Transport, London, UK, Sep. 2004.
- [29] T. Yano, T. Morikura, T. Sato: Community response to Shinkansen noise and vibration: a survey in areas along the Sanyo Shinkansen Line. Proceedings of Forum Acusticum, Budapest, Hungary, Aug. 2005.
- [30] H. Ma, T. Yano: Railway bonus for noise disturbance in laboratory settings. Acoustical Science and Technology **26** (2005) 258–266.
- [31] C. Cremezzi, P. E. Gautier, J. Lambert, P. Champelovier: Annoyance due to combined noise sources — advanced results. Proceedings of The 17th International Congress on Acoustics (ICA), Rome, Italy, Sep. 2001.

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## Low Frequency Noise and Annoyance

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Low frequency noise, the frequency range from about 10Hz to 200Hz, has been recognised as a special environmental noise problem, particularly to sensitive people in their homes. Conventional methods of assessing annoyance, typically based on A-weighted equivalent level, are inadequate for low frequency noise and lead to incorrect decisions by regulatory authorities.

There have been a large number of laboratory measurements of annoyance by low frequency noise, each with different spectra and levels, making comparisons difficult, but the main conclusions are that annoyance of low frequencies increases rapidly with level. Additionally the A-weighted level underestimates the effects of low frequency noises.

There is a possibility of learned aversion to low frequency noise, leading to annoyance and stress which may receive unsympathetic treatment from regulatory authorities. In particular, problems of the Hum often remain unresolved.

An approximate estimate is that about 2.5% of the population may have a low frequency threshold which is at least 12dB more sensitive than the average threshold, corresponding to nearly 1,000,000 persons in the 50–59 year old age group in the EU-15 countries. This is the group which generates many complaints.

Low frequency noise specific criteria have been introduced in some countries, but do not deal adequately with fluctuations. Validation of the criteria has been for a limited range of noises and subjects.

**Keywords:** Noise, low frequency noise, annoyance, subjective efforts, disturbance

### Introduction

Low frequency noise, considered as the frequency range from about 10Hz to 200Hz, causes extreme distress to a number of people who are sensitive to its effects. The sensitivity may be a result of heightened sensory response, within the whole or part of the auditory range, or may be acquired. Onset of low frequency noise annoyance tends to occur in middle age. The noise levels are often low, in the region of a subject's hearing threshold, where there are large differences between individuals. The problem arises both in homes and in offices, or similar, premises. Whilst noise sources causing annoyance in the home may be unknown, in offices they are often fans or pumps in the building services. Similar plant, in those apartment blocks which have central services, may be the source of the noise in these premises, but a core of low frequency noise problems

remain, of unknown origin, which continue to cause considerable annoyance. Low frequency noise problems also occur in industry, but generally at levels well above threshold, presenting a different noise problem to those in homes and offices.

Attempts to assess low frequency noise by conventional wide-band noise methods often fail, so illustrating the inadequacy of these methods for low frequencies. In particular, the regulatory dominance of A-weighted levels, leads to dismissal of valid problems of low frequency noise, so compounding the difficulties of some complainants

The World Health Organization recognizes the special place of low frequency noise as an environmental problem. Its publication on

Noise & Health 2004, 6:23, 59-72

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Community Noise (Berglund et al., 2000) makes a number of references to low frequency noise, some of which are as follows

*"It should be noted that low frequency noise, for example, from ventilation systems can disturb rest and sleep even at low sound levels"*

*"For noise with a large proportion of low frequency sounds a still lower guideline (than 30dBA) is recommended"*

*"When prominent low frequency components are present, noise measures based on A-weighting are inappropriate"*

*"Since A-weighting underestimates the sound pressure level of noise with low frequency components, a better assessment of health effects would be to use C-weighting"*

*"It should be noted that a large proportion of low frequency components in a noise may increase considerably the adverse effects on health"*

*"The evidence on low frequency noise is sufficiently strong to warrant immediate concern"*

## Annoyance

### The meaning of annoyance

Annoyance has roots in a complex of responses, which are moderated by personal and social characteristics of the complainant. (Beljovic and Jokovic, 2001; Benton and Leventhal, 1982; Fields, 1993; Grime, 2000; Guski, 1999; Guski et al., 1999; Kalveram, 2000; Kalveram et al., 1999; Siallen, 1999).

For example, Guski (1999) proposes that noise annoyance is partly due to acoustic factors and partly due to personal and social moderating variables as follows:

**Personal Moderators:** Sensitivity to noise. Anxiety about the source. Personal evaluation of the source. Coping capacity with respect to noise.

**Social Moderators:** Evaluation of the source.

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Suspicion of those who control the source. History of noise exposure. Expectations

Noise annoyance in the home is considered as leading to a long-term negative evaluation of living conditions, dependent on past disturbances and current attitudes and expectations. Annoyance brings feelings of disturbance, aggravation, dissatisfaction, concern, bother, displeasure, harassment, irritation, nuisance, vexation, exasperation, discomfort, uneasiness, distress, hate etc, some of which combine to produce the adverse reaction.

Figure 1, modified from Guski (1999) in order to emphasise the central nature of the personal factors, summarises the interactions. The interpretation of Figure 1 is as follows. The noise load causes activity interference (e.g. to communication, recreation, sleep), together with vegetative reactions (e.g. blood pressure changes, defensive reactions). Interference with activity develops into annoyance and disturbance. Prolonged vegetative reactions may lead to effects on health. The personal factors interact with the outer boxes of Figure 1, moderating the complainant's complex of responses. The social factors moderate how the complainant interacts with external authorities in attempting to deal with the annoyance. Social factors may also interact with health effects, as some social classes may more readily seek medical assistance. The personal and social moderating factors are so variable that Grime (2000) questions the feasibility of developing a national noise policy.

### Annoyance and the "meaning" of noise

Kalveram (2000) points out that much psychoacoustical noise research has limitations, because it is based upon the correlation between annoyance ratings and physical measurements of sound energy, often equivalent level, leading to noise dose. But equivalent level, A-weighted or linear, is only a part of the total process. Noise level and noise dose approaches neglect the "meaning" of a noise and are contrary to the interactive model in Figure 1. The noise level / noise dose assessment reduces Figure 1 to Figure

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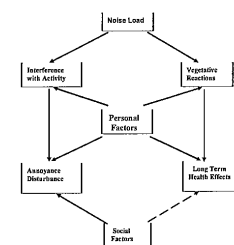


Figure 1. Factors moderating noise annoyance

2, in which the personal factors are constrained to those of the average person, so that only a limited number of subjects are protected by criteria which are developed from the assessment.

Kalveram proposes an "ecological" approach, which emphasises the psychological functions of sounds. Annoyance originates from acoustical signals which are not compatible with, or which disturb, these psychological functions. In particular, disturbance of current activities is a primary effect of noise exposure, producing a potential loss of fitness in the subject with respect to those behaviour patterns which permit coping with changes in the environment. Presence of a harmful sensory variable in the environment leads to actions which interrupt current behaviour, in an attempt by the subject to reduce the sensory input. This tests the coping capacity of the individual.

Those who have experienced long-term exposure to low frequency noise may recognise this within themselves. However, a few persons are known to have modified their responses to low frequency noise, thereby removing it from the category of a challenge and threat.

Most field work on noise annoyance has been where there is a known source, for example air or road transport. The particular circumstances of some low frequency noise problems, where the noise source is not known, adds an additional element to annoyance. Those affected suffer extreme frustration and may find it necessary to assume a source, thus enabling themselves to cope through provision of a focus for anger and resentment. Assumed sources have included neighbours, gas pipelines, radio transmissions and defence establishments.

### Annoyance Measurements

Annoyance measurements are generally of the type described by Kalveram (2000), an attempt to relate annoyance ratings directly to measured noise levels. As described above, these measurements are limited in their results, since they deal with only part of the annoyance complex.

### Laboratory determinations

There have been a large number of laboratory determinations of annoyance of low frequency sounds, mainly measurements using either "normal" or "sensitive" subjects. Stimuli have included tones, bands of noise or specially

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Figure 2. Noise dose interaction

developed spectra. There is, of course, a wide range of possible stimuli, which experimenters have chosen according to their experience of what is required (Adams, 1999; Andresen and Møller, 1984; Brøner and Leventhall, 1978; Brøner and Leventhall, 1984; Brøner and Leventhall, 1985; Goldstein, 1994; Goldstein and Kjellberg, 1985; Inukai et al., 2000; Kjellberg and Goldstein, 1985; Kjellberg et al., 1984; Møller, 1987; Nakamura and Inukai, 1998; Persson and Bjorkman, 1988; Persson-Wäy, 1985; Poulsen, 2002; Poulsen and Mortensen, 2002). Some of the laboratory studies have used recordings of real noises as stimuli, whilst others have worked with recordings of the actual noises as experienced by subjects in their own work places or homes (Holmberg et al., 1993; Landström et al., 1994; Mantoy et al., 2002; Mirowska, 1998; Mortensen and Poulsen, 2001; Poulsen and Mortensen, 2002; Tesarz et al., 1997; Vasudevan and Gordon, 1977; Vasudevan and Leventhall, 1982).

Most determinations have been aimed at relating the A-weighted level, or some other derivative of the spectrum of the low frequency noise, to its annoyance. Whilst they are adequate studies, and have shown some general factors in low frequency noise annoyance, they are limited in that their results apply only to the particular noises investigated, often with a small number of subjects. It is unlikely that continued studies of this kind will result in step changes in our understanding of low frequency noise annoyance. However, Poulsen and Mortensen (2002) are an advance on previous work, as they compare subjective assessments with criteria which have been developed in some European

countries, specifically for assessment of low frequency noise.

## Experimental methods

The responses required from subjects vary with experimental method. In laboratory investigations, subjects may be asked to "imagine" themselves relaxing in their homes in the evening and to rate annoyance by, for example, choice on a semantic scale ranging from 'Not Annoying' to 'Extremely Annoying'. Other methods include marking the level of annoyance on an unnumbered linear scale at a point between 'Not at all annoying' and 'Very annoying', or assigning a number to a reference noise and appropriate numbers to other noises in order to estimate their magnitudes. These psychological techniques are well established, but need care in their performance, as they are sensitive to experimental factors.

## Equal annoyance contours

The main results of this work are as follows. Møller (1987) investigated contours of equal annoyance for pure tones in the frequency range 4Hz to 31.5Hz. The annoyance contours are influenced by the narrowing of the range of equal loudness contours at low frequencies. Møller's results are shown in Figure 3. The vertical scale is the annoyance rating in terms of the distance marked for the tone along a 150mm linear scale. The lowest frequencies must be at a higher level than other frequencies in order to become audible but, once they are audible, their annoyance increases rapidly. For example, the scale rating range at 4Hz is about 10dB between extremes of annoyance. 8Hz and 16Hz have a 20dB range, whilst 31.5Hz has nearly 40dB range. The 1000Hz comparison, which is for an octave band of noise, has a range of nearly 60dB. These findings are important, as they confirm that the hearing contours are reflected in annoyance, although loudness and annoyance are not necessarily the same. Figure 3 gives averages for 18 subjects with normal hearing.

## Individual annoyance functions

Brøner and Leventhall (1978) measured individual annoyance functions for 20 subjects using ten low frequency noise stimuli. The

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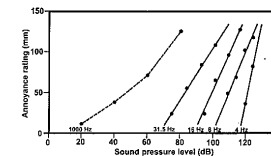


Figure 3. Annoyance rating, showing rapid growth at low frequencies

psychophysical function was assumed to be a simple power function

$$\psi = k\epsilon^\beta$$

Where  $\psi$  represents the estimation of psychological magnitude,  $\epsilon$  is the stimulus intensity and  $\beta$  a subject-specific exponent. It was shown that there was a wide range of individual exponents,  $\beta$ , from a low of 0.045 to a high of 0.4 and three groupings of individual differences were identified. Previous work at higher frequencies had also shown individual loudness functions (Barbera et al., 1970) and had posed the question of whether one set of regulations should be applied to all people (Bryan and Tempest, 1973).

## Annoyance and the dBA

A comparison of a band of noise peaking at 250Hz with a band peaking at 1000Hz, whilst both were adjusted to the same A-weighted level, showed that the annoyance from the low frequency noise was greater than that from the higher frequency noise at the same A-weighted level (Persson et al., 1985). This work was subsequently extended (Persson and Bjorkman, 1988; Persson et al., 1990) using a wider range of noises, for example, peaking at 80Hz, 250Hz, 500Hz and 1000Hz, leading to the following conclusions:

\* There is a large variability between subjects.  
\* The dBA underestimates annoyance for frequencies below about 200Hz.

For broadband low frequency noise, the underestimate was found to be 3dB for levels

around 65dB (Linear) and 6dB for levels around 70dB (Linear). Similar results had been obtained in earlier work (Kjellberg et al., 1984). Two broadband noises were investigated, in which one was dominated by energy in the 15-50Hz range. Twenty subjects compared the two noises within the dynamic range 45-86dBA. At equal A-weighted levels, the noise dominated by the low frequency component was perceived as 4-7dB louder and 5-8dB more annoying.

The energy input to the subjects was, of course, greater for the low frequency noises due to the attenuating effect of A-weighting, and it might be expected that there would be a greater effect, perhaps suggesting that loudness, assumed related to the A-weighting, differs from annoyance at low frequencies.

## Unpleasantness

The "unpleasantness" of low frequency noise has also been estimated (Inukai et al., 2000; Nakamura and Inukai, 1998). Nakamura and Inukai used a stimulus sound of a pure tone in 20 conditions from 3Hz to 40Hz and sound pressure levels from 70dB to 125dB, with evaluation by 17 subjects. There were four main subjective factors in response to low frequency noise: auditory perception, pressure on the eardrum, perception through vibration of the chest and more general feeling of vibration. Analysis of the responses showed that auditory perception was the controlling factor. That is, although high levels of low frequency noise may produce other sensations, the ear is the most sensitive receptor.

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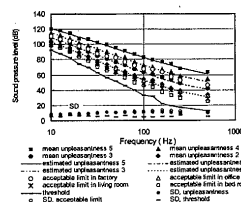


Figure 4. Equal unpleasantness contours and acceptable limits (Inukai)

Inukai et al (2000) determined "equal unpleasantness" contours for 39 subjects over a tone frequency range of 10 Hz to 500 Hz. A verbal scale was used ranging through: *Not at all unpleasant (1) - somewhat unpleasant (2) - unpleasant (3) - quite unpleasant (4) - very unpleasant (5)*. Subjects in a test chamber were asked to assume different home and work situations and adjust the level of a tone to match a level on the scale, as requested by the experimenter. For example if instructed to match to level 4 (*quite unpleasant*), subjects would adjust the tone until they judged that this level was reached. Results are shown in Figure 4. The numbers 1,2,3,4,5 refer to the unpleasantness level. All levels of unpleasantness are approximately linear with a negative slope of 5-6 dB per octave. The acceptable limits for different locations are all above the hearing threshold in this laboratory setting. For example, the self-adjusted acceptable limit in an assumed bedroom is more than 10 dB above threshold, but this might not be replicated for long term exposure at night in a real bedroom.

## Spectrum balance

The work by Inukai et al (2000) was for single tones. Spectrum balance has also been considered a factor in noise annoyance of a wideband spectrum. Correlation of a number of complaints with the corresponding spectra (Bryan, 1976) led to the conclusion that, for spectra which averaged as shown in Figure 5, a

fall off above 32 Hz of 5.7 dB/octave was acceptable, whilst a fall off from 63 Hz at 7.9 dB/octave was unacceptable. Work on acceptable spectra of air conditioning noise in offices led to similar conclusions (Blazier, 1981). Blazier found that, on average, acceptable office environments had a fall off of 5 dB/octave. An excess of low frequency noise led to rumble, an excess of mid frequency noise led to roar, whilst an excess of high frequency noise led to hiss. Later work (Blazier, 1997) developed a "Quality Assessment Index" for an HVAC noise through the balance of low, mid and high frequencies.

## (dBC - dBA) weighting

The difference between C- and A-weightings has also been considered as a predictor of annoyance (Broner, 1979; Broner and Leventhal, 1983; Kjellberg et al., 1997), as this difference is an indication of the amount of low frequency energy in the noise. If the difference is greater than 20 dB, there is the potential for a low frequency noise problem. Kjellberg et al used existing noise in work places (offices, laboratories, industry etc) with 508 subjects. Three sub-groups were obtained with a maximum difference in low and high frequency exposure. The conclusions on correlations of (dBC - dBA) difference and annoyance were that the difference is of limited value, but, when the difference exceeds 15 dB, an addition of 6 dB to the A-weighted level is a simple rating procedure. However, the difference breaks down

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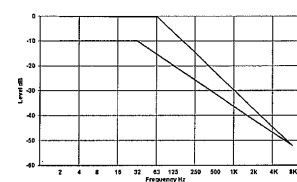


Figure 5. Acceptable and unacceptable spectrum slopes

when the levels are low, since the low frequencies may then be below threshold. The (dBC - dBA) difference cannot be used as an annoyance predictor, but is a simple indicator of whether further investigations may be necessary.

## Home and work environments

Other studies, have assessed low frequency noise in real or assumed work environments or in the home (Bryan, 1976; Cocchi et al., 1992; Holmberg et al., 1997; Holmberg et al., 1993; Holmberg et al., 1996; Landström et al., 1993; Landström et al., 1994; Lundin and Ahman, 1998; Mirovskaya, 1998; Vasudevan and Gordon, 1977; Vasudevan and Leventhal, 1982).

Holmberg et al (1996 and 1997) assessed noise in real environments. The 1996 paper compared responses of about 240 subjects with the noise measures which might be available on a sound level meter i.e. dBLIN, dBA, dBC, dBC and dBD and the difference (dBC-dBA). Additionally, Zwicker loudness (ISO332, 1975) and Low Frequency Noise Rating (LFNR) (Broner and Leventhal, 1983) were calculated. There was poor correlation between the sound level meter weightings and annoyance. Similarly, the loudness in sones and the difference (dBC - dBA) did not correlate well.

The LFNR did separate out annoying and not annoying noises, but no more effectively than the (dBC - dBA).

## Level variations

Holmberg et al (1997) investigated noise in workplaces, using the (dBC - dBA) difference as an indicator. Low frequency noise exposure was found in a group of 35 out of a total of 337 persons. Measurements of temporal variation of the levels of low frequency noise at the workplaces, averaged over 0.5, 1.0 or 2.0 seconds, was correlated with subjective annoyance. Significant correlation was found between the irregularity of the noise levels and annoyance.

This work represents an advance, in that it shows the importance of fluctuations in noise level. A limitation of much work on assessment of low frequency noise has been that long term averaged measurements were used and, consequently, information on fluctuations was lost, although complaints of low frequency noise often refer to its throbbing or pulsing nature. Broner and Leventhal (1983) had noted the importance of fluctuations and suggested a fluctuation penalty of 3 dB in the Low Frequency Noise Rating Assessment. The importance of fluctuations has also been assessed in laboratory experiments (Bradley, 1994). Subjects listened first to steady wideband noises which peaked at 31.5 Hz and adjusted the overall level of these to be equally annoying to a reference spectrum which fell at 5 dB/octave. It was found that the more prominent the low frequency noise, the greater the reduction in level required for

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equality of annoyance with the reference spectrum. The test spectra were now amplitude modulated, in the low frequency region only, at modulation frequencies of 0.25, 0.5, 1.0, 2.0 and 4.0Hz and depths of 10dB and 17dB. Subjects again adjusted the level of the noises to produce equal annoyance with the unmodulated reference noise. The reductions varied with modulation frequency and modulation depth. An example is that, for the highest modulation depth at 2.0Hz modulation frequency, the level was reduced by 12.9dB averaged over the subjects. This work confirms the importance of fluctuations as a contributor to annoyance, and the consequent limitation of those assessment methods which do not include fluctuations.

## Field investigations

Vasudevan and Gordon (1977) carried out field measurements and laboratory studies of persons who complained of low frequency noise in their homes. A number of common factors were shown:

- The problems arose in quiet rural or suburban environments
- The noise was often close to inaudibility and heard by a minority of people
- The noise was typically audible indoors and not outdoors
- The noise was more audible at night than day
- The noise had a throb or rumble characteristic
- The main complaints came from the 55-70 years age group
- The complainants had normal hearing.
- Medical examination excluded tinnitus.

These are now recognised as classic descriptors of low frequency noise problems.

Further work in the laboratory showed that gradually falling spectra, as measured in the field and simulated in the laboratory, possessed a rumble characteristic. Figure 6 compares measured noise on the left with a simulated noise on the right. Both fell at 7-8 dB/octave and had similar rumble characteristics. It is also known that a rapidly falling spectrum, such as one which follows the curve of the NR or NC ratings has an unpleasant quality. This was one reason for the development of the PNC rating as an improvement of the NC rating (Beranek et al.,

1971). Further work (Vasudevan and Leventhall, 1982), confirmed that levels close to threshold caused annoyance, which increased if the noise also fluctuated. This work included spectra with tonal peaks and emphasised that the nature (quality) of the noise was important. Fluctuating noises are more annoying than predicted by their average sound levels.

Recent work on annoyance to people in their homes has been by Mirowska (1998) and Lundin and Ahman (1998). Both these papers considered annoyance due to plant or appliances, installed in, or adjacent to, living accommodation. Mirowska found problems from machinery, including transformers in electricity substations, ventilation fans, refrigeration units and central heating pumps. Lundin and Ahman investigated a husband and wife who experienced typical symptoms of aversion to low frequency noise. Refrigerators and freezers were suspected as the source of the offending noise which, in some parts of the building, was high at 50Hz. The time varying pattern of the noise, due to equipment cycling, was considered to add to its annoyance. However, there was no totally convincing link between effects on health and the noise.

## Development of enhanced susceptibility.

It is known that different regions of the brain are responsible for different functions. The brain also possesses "plasticity", in the sense that parts within the same region may change their function. For example, extensive training in a frequency discrimination task in small mammals leads to improved discrimination ability and an expansion of the cortical area responsive to the frequencies which were used during training. (Schupp and Kacelnick, 2002).

In humans, there is considerable plasticity in the brain during its early development, requiring appropriate stimuli for proper growth. Plastic adaptation is slower in the adult brain. Two examples of plastic adaptation are: London taxi drivers are required to memorise many routes through London. Magnetic resonance imaging showed that the part of the brain associated with spatial navigation, the posterior hippocampus, enlarged at the expense

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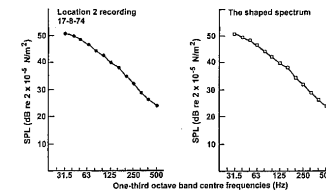


Figure 6. Measured spectrum (left) and simulated spectrum (right)

of neighbouring regions (Maguire et al., 2000). There has been a similar finding for skilled musicians (Pantev et al., 1998). Cortical reorganisation was greater the younger the age at which music training began.

The significance of these findings for low frequency noise annoyance is: There is clear evidence that the brain is able to adapt to stimuli.

If complainants spend a great deal of time listening to, and listening for, their particular noise, it is possible that they may develop enhanced susceptibility to this noise.

Enhanced susceptibility is therefore a potential factor in long-term low frequency noise annoyance.

## Low frequency noise annoyance and stress

Stresses may be grouped into three broad types: cataclysmic stress, personal stress and background stress. Cataclysmic stress includes widespread and devastating physical events. Personal stress includes bereavements and other personal tragedies. Cataclysmic and personal stresses are evident occurrences, which are met with sympathy and support, whilst their impacts normally reduce with time. Background stresses are persistent events, which may become routine elements of our life. Constant low frequency noise has been classified as a background

stressor (Benton, 1997; Benton and Leventhall, 1994). Whilst it is acceptable, under the effects of cataclysmic and personal stress, to withdraw from coping with normal daily demands, this is not permitted for low level background stresses. Inadequate reserves of coping ability then leads to the development of stress symptoms. In this way, chronic psychophysiological damage may result from long-term exposure to low-level low frequency noise.

Changes in behaviour also follow from long-term exposure to low frequency noise. Those exposed may adopt protective strategies, such as sleeping in their garage if the noise is less disturbing there. Or they may sleep elsewhere, returning to their own homes only during the day. Others tense into the noise and, over time, may undergo character changes, particularly in relation to social orientation, consistent with their failure to recruit support and agreement from the regulatory authority that they do have a genuine noise problem. Their families, and the investigating officer, may also become part of their problem. The claim that their "lives have been ruined" by the noise is not an exaggeration, although their reaction to the noise might have been modifiable at an earlier stage.

## The HUM Occurrence

Hum is the name given to a low frequency noise

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which is causing persistent complaints, but often cannot be traced to a single, or any, source. If a source is located, the problem moves into the category of engineering noise control and is no longer "the Hum", although there may be a long period between first complaint and final solution. The Hum is widespread, affecting scattered individuals, but periodically a Hum focus arises where there are multiple complaints within a town or area. There has been the Bristol Hum (England), Largs Hum (Scotland), Copenhagen Hum (Denmark), Vancouver Hum (Canada), Taos Hum (New Mexico USA), Kokomo Hum (Indiana USA) etc. A feature of these Hums is that they have been publicised in local and national press, so gathering a momentum which otherwise might not have occurred, possibly increasing the number of adverse reactions. Although the named Hums, such as Kokomo, have gained much attention, they should not be allowed to detract from the individuals who suffer on their own.

## Hum character

The sound of the Hum differs between individuals. Even in the areas of multiple complaints, the description is not completely consistent, although this may be because people use different words to describe the same property of a noise. Publicity tends to pull the descriptions together. The general descriptors of the sound of the Hum include: a steady hum, a throb, a low speed diesel engine, rumble and pulsing. A higher pitch, such as a hiss, is sometimes attributed. The effects of the Hum may include pressure or pain in the ear or head, body vibration or pain, loss of concentration, nausea and sleep disturbance. These general descriptors and effects occur internationally with close similarity.

Unsympathetic handling of the complaint leads to a build-up of stress, which exacerbates the problems. Hum sufferers tend to be middle aged and elderly, with a majority of women. They may have a low tolerance level and be prone to negative reactions. The knowledge that complaints are being taken seriously by the authorities helps to reduce personal tensions, by

causing the additional stresses consequent upon not being believed. This is particularly so when, as is often the case, only one person in a family is sensitive to the noise. Whilst some Hum sufferers may have tinnitus, they will, of course, also be troubled by intruding noise at a different frequency from their tinnitus. Tinnitus should not be used as a reason to reject a complaint of low frequency noise annoyance.

## Psychological aspects of the Hum

Psychosocial factors affect the physiological impact of noise (Hatfield et al., 2001). Adverse physiological consequences may be mediated by psychological factors related to the noise exposure. It is plausible that excessive noise exposure promotes negative psychological reactions, leading to adverse physiological effects, as was shown by Hatfield et al. (2001). Therefore, psychological factors must be addressed to help ameliorate the annoyance of low frequency noise.

Some Hum sufferers have achieved this for themselves, saying that they have "learned to live with the Hum" so that it no longer worries them. Others are "cured" by prescription of relaxant drugs. For a few, the Hum goes away after a time. Some escape the Hum by moving house. One long term sufferer, and leading campaigner for official help with low frequency noise problems, decided that it was time to leave the low frequency forest of chaotic emotions and now has no problem, remaining detached from low frequency noise and of the opinion that to become involved with other sufferers heightens ones awareness of the noise. Some sufferers accept that the noises are not at a high level, but that their reactions are equivalent to those which might be expected from a high level of noise – "As soon as I hear the noise, something builds up inside me". This is a similar response to that of hyperacusis sufferers, although more specialised in its triggers. A form of hyperacusis may be indicated.

Combined acoustical and psychological studies (Kitamura and Yamada, 2002) have explored involvement of the limbic system of the brain in

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annoyance responses<sup>1</sup>. The limbic system commands survival and emotional behaviours, which we cannot always control, although we may learn to do so.

The Hum remains a puzzling aspect of low frequency noise. No widespread Hum has been unequivocally traced to specific sources, although suspicion has pointed at industrial complexes, especially fans.

In the absence of known sources, Hum sufferers often search their neighbourhoods for a source, walking or driving around at night. It is important for them to find a target for their frustrations. Some general ones include their neighbours, the main gas pipelines, radio transmissions (particularly pulsed signals for navigation), defence establishments etc.

## Auditory sensitivity

Special difficulties arise when, despite persistent annoyance, there is no "measurable" noise or, as might occur in urban areas, the noise levels at low frequencies are in the 40 - 50dB range, well below the average threshold (ISO-226, 1987). Van den Berg supports tinnitus as an explanation in these circumstances (van den Berg, 2001). With respect to audibility, the average ISO-226 threshold levels must be interpreted carefully. Van den Berg's choice of a limit criterion is the low frequency binaural hearing threshold level for 10% of the 50 - 59 year old population, which is 10-12 dB below their average hearing level (van den Berg and Paschke-Vermee, 1999a). This may be too restrictive a cut off, since 10% of the age group has more sensitive hearing. For example, the population of the EU-15 countries is 379,000,000. There are differences between north and southern European countries, but approximately 10% of the population is in the 50 - 59 year age group. Thus, about 3,800,000 of the 50 - 59 year age group of the European population (10% of 10%

of the total) will be more sensitive than the suggested cut-off for assessment of low frequency noise for this age group. A smaller number will have greater sensitivity. Yamada found one subject to be 15dB more sensitive than the average (Yamada, 1980), whilst recent work (Kitamura and Yamada, 2002), gives two standard deviations from the average threshold as about 12dB. However, the average threshold of the complaints in this work is somewhat higher than the ISO 226 threshold, as might be expected for older people. A range of two standard deviations covers 95% of people. Of the remaining 5%, half are more sensitive than two standard deviations from the average and half are less sensitive. In the EU-15 countries, 2.5% of the population is about 10,000,000 persons of whom around 1,000,000 are in the 50-59 year old age group, who might have very sensitive low frequency hearing and be prone to annoyance from sounds which are not heard by most people and which are difficult to measure. The unfortunate association of one of these people with a low level, low frequency noise leads to considerable distress for the person concerned. A "rule of thumb" may be to take 15 - 20dB below the ISO 226 threshold as the cut off for perception, but this may be a generous level, depending on the complainants' individual threshold at low frequencies.

The preceding deductions on numbers of persons are clearly approximate, but are sufficient to give an "engineering" indication of the extent of the problem.

## Criteria for low frequency noise control

A number of criteria have been developed for assessment of low frequency noise. (Broer and Leventhall, 1983; Challis and Challis, 1978; Inukai et al., 1990; Vercammen, 1989; Vercammen, 1992).

In recent years, some European countries have adopted national criteria for low frequency

<sup>1</sup> The human brain has three layers representing its three stages of development. The primitive (reptilian) brain is connected with self preservation. The intermediate (old mammalian) brain is the brain of the inferior animals and related to emotions. This is the limbic system. The superior (new mammalian) brain is related to rational thought and intellectual tasks. The limbic system is activated by perceived threats.

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Table 1. Test noises

No. Noise	Description	Level, dBA (Leq)
1 Traffic	Real traffic noise from a highway	65 dBA, continuous
2 Shop Bang	Isolated blow down a shop (long)	105 dBA, impulse
3 Gun Bang	Closest to a rifle	120 dBA, impulse
4 Fan Bang	High speed fan, rotating	115 dBA, impulse
5 Steel Bang	Isolated noise from a steel rolling	110 dBA, impulse
6 Generator	Generator	75 dBA, continuous
7 Cooling	Cooling tower noise	100 dBA, 100 Hz to 10 kHz
8 Transformer	Electric transformer through a building	70 dBA, continuous

noise, including Sweden (Socialstyrelsen, Sweden, 1996), Denmark (Jakobsen, 2001) Netherlands (N S G, 1999) Germany (DIN-45680, 1977), Poland (Mroczka, 2002). Some of these methods assume a threshold curve for limitation of annoyance, based approximately on the ISO226 threshold, or a curve parallel to this threshold, but extended to frequencies below 20Hz.

The criteria have been compared under laboratory conditions for some specific noises (Poulsen, 2002; Poulsen and Mortensen, 2002). Noises used were eight recorded samples of different types as shown in Table 1.

The noises were judged by 18 otologically normal young listeners and by four older people (41-57 years) who had made complaints of annoyance by low frequency noise. Judgements were made under assumed listening circumstances of day, evening and night. The complaint group rated the noises to be more annoying than the other group did. Overall, the Danish method gave highest correlation between objective and subjective assessments, but only when a 5dB penalty for impulsive sounds was included.

## Conclusions

Regulatory authorities must accept that annoyance by low frequency noise presents a real problem which is not addressed by the commonly used assessment methods. In particular, the A-weighted level is very inadequate, as are the NR and NC criterion curves. Assessment methods specific to low

frequency noise are emerging, but a limitation of existing methods is that they do not give full assessment of fluctuations. It is possible that application of noise quality concepts, in particular fluctuation and roughness (Zwicker and Fastl, 1999), may be a way forward.

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## References

- Adam, R. (1999). Subjective response to low frequency noise, PhD, South Bank University, London.
- Andersen, J., and Møller, H. (1994). Equal annoyance contours for low frequency noise. *Jnl Low Freq Noise Vbn* 3, 1-9.
- Barbenza, C. M., Bryan, M. E., and Tempest, W. (1970). Individual loudness functions. *J Sound Vibration* 11, 399-410.
- Belajovic, G., and Jakovljevic, B. (2001). Factors influencing subjective noise sensitivity in an urban population. *Noise and Health* 4, 17-24.
- Benton, S. (1997). Low frequency noise and the impact upon an individual's quality of life: Case study reports. *Jnl Low Freq Noise Vbn* 16, 203-208.
- Benton, S., and Leventhall, H. G. (1982). The effect of auditory processing on the development of low level low frequency noise criteria. *Jnl Low Freq Noise Vbn* 1, 97-108.
- Benton, S., and Leventhall, H. G. (1990). The role of "background stressors" in the formation of annoyance and stress responses. *Jnl Low Freq Noise Vbn* 13, 95-102.
- Beranek, L. L., Blazier, W. E., and Figue, J. J. (1971). Preferred Noise Criterion Curves (PNC) and their application to rooms. *J Acoust Soc Am* 50, 1223-1228.
- Berglund, B., Lindvall, T., Schwela, D., and Osh, K.-T. (2000). Guidelines for Community Noise. *World Health Organisation*.
- Blazier, W. E. (1981). Revised noise criteria for application in the acoustic design of, and rating of HVAC systems. *Noise Control Eng* 16, 64-72.

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Leventhall new.gsp 01/07/2004 14:41 Page 71

- Blazier, W. E. (1997). RC Mark II: A refined procedure for rating noise of heating ventilating and air conditioning (HVAC) systems in buildings. *Noise Control Eng* 45, 243-250.
- Bradley, J. S. (1994). Annoyance caused by constant amplitude and amplitude modulated sounds containing variable noise. *Noise Control Eng* 42, 203-208.
- Brown, N. (1979). Low frequency noise annoyance. PhD Chelsea College, University of London.
- Brown, N., and Leventhall, H. G. (1978). Individual annoyance functions. *Acoustics Letters* 2, 22-25.
- Brown, N., and Leventhall, H. G. (1983). Low frequency noise annoyance assessment by Low Frequency Noise Rating (LFNR) Curves. *Jnl Low Freq Noise Vbn* 2, 20-28.
- Brown, N., and Leventhall, H. G. (1984). The annoyance, loudness and unacceptability of lower level low frequency noise. *Jnl Low Freq Noise Vbn* 3, 154-160.
- Brown, N., and Leventhall, H. G. (1985). Annoyance and unacceptability of higher level low frequency noise. *Jnl Low Freq Noise Vbn* 4, 1-11.
- Bryan, M. E. (1976). Low frequency noise annoyance. In: *Infra-sound and Low Frequency Vibration*. Editor: W. Tempest. Academic Press.
- Bryan, M. E., and Tempest, W. (1973). Are our noise laws adequate. *Applied Acoustics* 6, 219-233.
- Challis, L. A., and Challis, A. M. (1978). Low frequency noise problems from gas turbine power stations. *Proc Interscience* 78, pp. 475-480.
- Cocchi, A., Fausti, P., and Piva, S. (1992). Experimental characteristics of the low frequency noise annoyance arising from industrial plants. *Jnl Low Freq Noise Vbn* 11, 124-132.
- DIN-45680 (1977). Measurement and evaluation of low-frequency environmental noise.
- Field, J. M. (1993). Effect of personal and situational variables on noise annoyance in residential areas. *J Acoust Soc Am* 93, 2753-2763.
- Goldstein, M. (1994). Low-frequency components in complex noise and their perceived loudness and annoyance. National Institute of Occupational Health (Arbetsmiljöinstitutet) Solna.
- Goldstein, M., and Kjellberg, A. (1985). Annoyance and low frequency noise with different slopes of the frequency spectrum. *Jnl Low Freq Noise Vbn* 4, 43-51.
- Grime, S. (2000). Against a National Noise Strategy. *Environmental Health Journal* 108.
- Guski, R. (1999). Personal and social variables as determinants of noise annoyance. *Noise and Health* 1, 45-56.
- Guski, R., Felcher-Schä, U., and Scheunert, R. (1999). The concept of noise annoyance: How international experts see it. *J Sound Vibration* 223, 515-527.
- Harfield, J., Job, R., Carter, N., Peglow, P., Taylor, R., and Morrell, S. (2001). The influence of psychological factors on self-reported physiological effects of noise. *Noise and Health* 3, 1-15.
- Holmberg, K., Landström, U., and Kjellberg, A. (1997). Low frequency noise level variations and annoyance in working environments. *Jnl Low Freq Noise Vbn* 16, 81-88.
- Holmberg, K., Landström, U., and Kjellberg, A. (1993). Effects of ventilation noise due to frequency characteristics and sound level. *Jnl Low Freq Noise Vbn* 12, 115-122.
- Holmberg, K., Landström, U., Söderberg, L., and Kjellberg, A. (1996). Hygienic assessment of low frequency noise annoyance in working environments. *Jnl Low Freq Noise Vbn* 15, 7-16.
- Inakai, Y., Nakamura, N., and Taya, H. (2000). Unpleasantness and acceptable limits of low frequency sound. *Jnl Low Freq Noise Vbn* 19.
- Inakai, Y., Taya, H., Utsugi, A., and Nagamatsu, N. (1990). A new evaluation method for low frequency noise. *Proc Interscience* 90, 1441.
- ISO232 (1975). Method for calculating loudness level.
- ISO226 (1987). Normal equal-loudness level contours.
- Jakobsen, J. (2001). Danish guidelines on environmental low frequency noise, *Infra-sound and vibration*. *Jnl Low Freq Noise Vbn & Active Control* 20, 141-148.
- Kalveram, K. T. (2000). How acoustical noise can cause physiological and psychological reactions. 5th Int Symp Transport Noise and Vibration. June 2000, St. Petersburg, Russia.
- Kalveram, K. T., Dasow, J., and Vogt, J. (1999). How information about the source influences noise annoyance. *ASA/EAADAGA Meeting March 1999*, Berlin (CDROM).
- Kikunaga, T., and Yamada, S. (2002). Psychological analysis of influence of low frequency noise and relation between brain structure and psychological response. *Proc 10th International Meeting Low Frequency Noise and Vibration and its Control*. York, UK Sept 2002 (Editor: H. G. Leventhall).
- Kjellberg, A., and Goldstein, M. (1985). Loudness assessment of broad noise of varying bandwidth and spectral shape. An evaluation of various frequency weighting networks. *Jnl Low Freq Noise Vbn* 4, 12-26.
- Kjellberg, A., Goldstein, M., and Gamberale, F. (1984). An assessment of dB(A) for predicting loudness and annoyance of noise containing low frequency components. *Jnl Low Freq Noise Vbn* 3, 10-16.
- Kjellberg, A., Tenzar, M., Holberg, K., and Landström, U. (1997). Evaluation of frequency-weighted sound level measurements for prediction of low-frequency noise annoyance. *Environment International* 23, 519-527.

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- Landström, U., Kjellberg, A., and Byström, M. (1993): Acceptable levels of sounds with different spectral characteristics during the performance of a simple and a complex non-auditory task. *J. Sound Vibration* 160, 533-542.
- Landström, U., Kjellberg, A., Söderberg, L., and Nordström, B. (1994): Measures against ventilation noise: Which true frequencies are least and most annoying. *J. Low Freq Noise Vib* 13, 81-88.
- Leventhal, H. G. (2003): A review of published research on low frequency noise and its effects. *Prepared for DoFta*. [www.dofta.gov.uk/environment/infocentre/lowfrequency](http://www.dofta.gov.uk/environment/infocentre/lowfrequency)
- Landin, A., and Ahman, M. (1998): Case report: Is low frequency noise from refrigerators in a multi-family house a cause of diffuse disorders? *J. Low Freq Noise Vib* 17, 65-70.
- Maguire, E. A., Gadian, D. G., Johnsrude, J. S., Good, C. D., Ashburner, J., Frackowiak, R. S. J., and Frith, C. D. (2000): Navigation related structural change in the hippocampus of taxi drivers. *Proc Nat Acad Sci* 97, 4398-4403.
- Manley, D. M. J. P., Styles, P., and Scott, J. (2002): Perceptions of the public of low frequency noise. *J. Low Freq Noise Vib* 21, 2002.
- Mirowska, M. (1998): An investigation and assessment of low frequency noise in dwellings. *J. Low Freq Noise Vib* 17, 119-126.
- Mirowska, M. (2002): Problems of measurement and evaluation of low frequency noise in residential buildings in the light of recommendations and the new European standards. 10th International Meeting Low Frequency Noise and Vibration and its Control. York UK (Editor: H G Leventhal), 261-268.
- Moller, H. (1987): Annoyance of audible infrasound. *J. Low Freq Noise Vib* 6, 1-17.
- Mortensen, F. R., and Poulsen, T. (2001): Annoyance of low frequency noise and traffic noise. *J. Low Freq Noise Vib* 20, 193-196.
- N S G (1999): NSG-Richtlijn Laufrequent Geluid.
- Nakamura, N., and Inaki, Y. (1989): Proposal of models which indicate unpleasantness of low frequency noise using exploratory factor analysis and structural covariance analysis. *J. Low Freq Noise Vib* 17, 127-132.
- Pantazis, C., Oostenveld, R. A., E. Rees, D., Roberts, L. E., and Hoke, M. (1998): Increased auditory cortical response in musicians. *Nature* April 23 392 (6678), 811-814.
- Persson, K., and Björkman, M. (1988): Annoyance due to low frequency noise and the use of the dB(A) scale. *J. Sound Vibration* 127, 491-497.
- Persson, K., Björkman, M., and Rylander, R. (1985): An experimental evaluation of annoyance due to low frequency noise. *J. Low Freq Noise Vib* 4, 145-153.
- Persson, K., Björkman, M., and Rylander, R. (1990): Loudness, annoyance and the dBA in evaluating low frequency sounds. *J. Low Freq Noise Vib* 9, 32-45.
- Persson-Waye, K. (1985): An experimental evaluation of annoyance due to low frequency noise. *J. Low Freq Noise Vib* 4, 145-153.
- Poulsen, T. (2002): Laboratory determination of annoyance of low frequency noise. 10th International Meeting Low Frequency Noise and Vibration and its Control. York UK (Editor: H G Leventhal), 19-26, pp. 19-28.
- Poulsen, T., and Mortensen, F. R. (2002): Laboratory evaluation of annoyance of low frequency noise. *Working Paper No. 2 2002 Danish Environmental Protection Agency*.
- Schnupp, J. W. H., and Kasechick, O. (2002): Cortical plasticity: Learning from cortical reorganization. *Current Biology* 12, 144-146.
- Societysvets-Sweden (1996): SOSFS 1996:77E. Indoor Noise and High Sound Levels.
- Stallen, P. (1999): A theoretical framework for environmental noise annoyance. *Noise and Health* 1, 69-80.
- Tearz, M., Kjellberg, A., Landström, U., and Holmberg, K. (1997): Subjective response patterns related to low frequency noise. *J. Low Freq Noise Vib* 16, 145-150.
- van den Berg, G. P. (2001): Tinnitus as a cause of low frequency noise complaints. *Proc Internoise 2001, den Hague*.
- Vaudevan, R. N., and Gordon, C. G. (1977): Experimental study of annoyance due to low frequency environmental noise. *Applied Acoustics* 10, 57-69.
- Vaudevan, R. N., and Leventhal, H. G. (1982): A study of annoyance due to low frequency noise in the home. *J. Low Freq Noise Vib* 2, 157-164.
- Vercammen, M. L. S. (1989): Setting limits for low frequency noise. *J. Low Freq Noise Vib* 8, 105-109.
- Vercammen, M. L. S. (1992): Low frequency noise limits. *J. Low Freq Noise Vib* 11, 7-13.
- Yamada, S. (1980): Hearing of low frequency sound and influence on the body. Conference on Low Frequency Noise and Hearing. Aalborg, Denmark, 95-102. (Editors: H Møller and R Rubeck).
- Zwicker, E., and Fastl, H. (1999): Psycho-acoustics. Facts and Models. Springer.

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PAPER

## Experimental Investigation of Low-frequency Wayside Noise from High-speed Train

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The authors performed laboratory experiments and field measurements to investigate low-frequency noise generated in wayside environments from high-speed train running. The results indicated the following three types of low-frequency sound sources: pressure fields around the nose and tail parts of the train, low-frequency acoustic pressure waves aerodynamically caused by the train itself, and noise radiation from vibrating concrete railway viaducts. Measurements conducted in a higher-speed section revealed that the major sound source of low-frequency noise in the far field was aerodynamically generated unsteady flow, which is analogous to a line source.

Keywords: high-speed train, low-frequency noise, aerodynamic sound, concrete bridge noise

## 1. Introduction

It has been reported that, in addition to audible noise, low-frequency noise including infrasound is radiated from high-speed trains (known as *Shinkansen* in Japan) toward open wayside areas, and represents one of technological barrier to the future development of higher-speed vehicles [1]. The low-frequency noise referred to here is components with a frequency below 100 Hz. In previous studies, we measured low-frequency wayside noise caused by trains in an open section running in the range of 240 ~ 340 km/h. Measurement was carried out based on a manual issued by Japan's Ministry of the Environment (MOE), representing the first official document in Japan to specify the method of measuring low-frequency noise [2]. Though the low-frequency wayside noise measured was relatively weak, it is expected to become stronger as train speeds increase.

These previous measurements indicated that two types of noise source are significant in low-frequency wayside noise, as shown in Fig. 1. The first consists of pressure variations caused by a train moving with quasi-steady pressure fields around its nose and tail parts, referred to as *passing-train pressure fields* (hereafter  $P_p$ ). This phenomenon has been well investigated analytically using potential theory [3]. The other is referred to as *low-frequency acoustic pressure waves* (hereafter  $P_w$ ), which have frequencies between 20 and 100 Hz. Though past investigation suggested that this phenomenon was related to unsteady disturbed airflow around the train and the vibrating concrete structures of railway viaducts, the exact cause was not understood [4].

In this study, to provide a deeper understanding of  $P_w$  phenomenon, field measurements were performed at several types of sites. Furthermore, in order to identify the aerodynamic characteristics of low-frequency wayside noise, laboratory experiments using an axisymmetric model were conducted in a higher speed range of 300 ~ 500 km/h. Comparison between the field and laboratory measurements was made, enabling significant conclusions to be drawn.

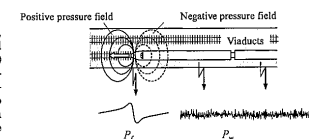


Fig. 1 Schematic view of low-frequency noise radiated from a train.  $P_p$  represents pressure variations caused by moving pressure fields around the nose and tail parts of the vehicle.  $P_w$  represents low-frequency acoustic pressure waves caused by unsteady disturbed flow around the train and the vibrating structures of viaducts.

## 2. Simple scale-model aerodynamic experiment

The pressure variation of  $P_p$  is modeled by a moving monopole given by [3]

$$P_p(x, t) = -\frac{\rho_0 U^2 A_0 \cos(\alpha, y)}{2\pi r^2} \quad (1)$$

where  $\rho_0$  is the mean air density,  $U$  is the train speed,  $A_0$  is the cross-sectional area of the train,  $\cos(\alpha, y)$  is the cosine of the angle of the monopole source point  $y$  at time  $t$  relative to observation point  $x$ , and  $r = |x - y|$  is the distance from the observation point to the monopole source point. Equation (1) shows that the magnitude of  $P_p$  is inversely proportional to the square of distance  $r$ , and is proportional to the square of train speed  $U$ .

The acoustic source mechanisms of  $P_w$  are considered to relate to noise radiation from concrete railway viaducts (hereafter  $P_{w,v}$ ) and the unsteady disturbed airflow around the train (hereafter  $P_{w,t}$ ). The magnitude of  $P_{w,v}$  depends on the type of viaduct structure, the weight of the train and the roughness of the rail/wheel treads. Under regular conditions of these variables, the magnitude of  $P_{w,v}$  is empirically given by [5]

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$$P_{w,a} \propto \frac{U^{1.5}}{\sqrt{r}} \quad (2)$$

No theoretical/empirical formula exists for the magnitude of  $P_{w,a}$  because of the lack of an understanding about the exact cause. Assuming that the main source of  $P_{w,a}$  is the unsteady disturbed airflow at the whole surface of the car body rather than at specific parts, we estimate the characteristic of  $P_{w,a}$  by the following laboratory experiments using an axisymmetric model; these experiments can be performed in a high speed range without noise from railway viaducts.

## 2.1 Wind-tunnel experiment

The experiments reported here were carried out using a simple scale-model train at about 1/110 of full scale train. The model had an axisymmetric body with ellipsoidal nose and tail profiles and the dimensions given in Table 1. The model did not cause Aeolian tones or cavity tones due to its smooth surface without projections or gaps.

A preliminary experiment was performed to evaluate the statistical values of the boundary layer around the model surface using the closed-circuit wind tunnel facility at the Railway Technical Research Institute (RTRI). The experimental apparatus is shown in Fig. 2. The test section has a cross-section width of 720 mm and a height of 600 mm, and measures 1.5 m in length. The experiment was conducted with a wind velocity of  $U = 150$  km/h, which was lower than the actual train speed because low turbulence and uniform flow were high priorities in this experiment. Velocity measurements were made using a Dantec 55P11 constant-temperature hot-wire anemometer and linearizer. The hot wire was platinum with a diameter of 2.5  $\mu$ m and a length of 1.25 mm, and the system frequency response was 5 kHz.

Figure 3 (a) shows the downstream development of velocity statistics in the boundary layer above the model surface, where  $x$  is the distance from the nose to the observation point,  $\delta$  is the boundary layer thickness defined as the distance required for the flow to reach  $0.99U$ ,  $\delta^*$  is the displacement thickness,  $\sqrt{u_{\delta\delta}^2}/U_\infty$  represents the turbulence intensity at  $0.4\delta$ , and  $H_{12} (= \delta^*/\theta)$  is the shape factor defined by  $\delta^*$  and the momentum thickness  $\theta$ . Figure 3 (b) shows the downstream development of intermittency factor  $\Gamma$  in the boundary layer, representing the ratio

Table 1 Train model specifications

Uniform diameter	$d = 34.64$ mm (about 1/110 of full scale train)
Nose/tail length	$L = 51.96$ mm
Nose/tail shapes	Axisymmetric ellipsoid $2L/d = 3$
Overall length	(i) $L = 800$ mm (setup for wind tunnel) (ii) $L = 1300, 2500$ mm (setup for model launch)
Machined surface	Arithmetic average roughness $R_a = 6.3\mu$ (JIS B 0601)
Material	MC nylon polyamides 6 (MC901)

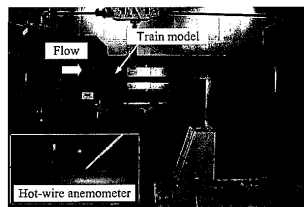


Fig. 2 Experimental setup of the axisymmetric model train in the wind tunnel facility

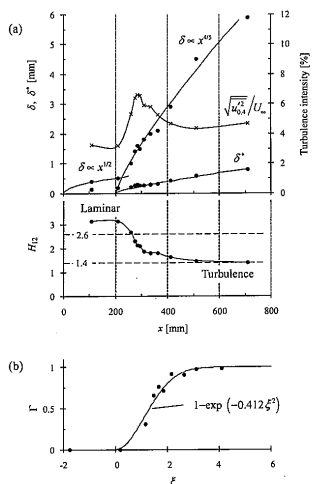


Fig. 3 Results of downstream development for (a) velocity statistics, and (b) intermittency factor

of laminar flow to turbulence flow;  $\Gamma = 1 - \exp(-0.412\xi^2)$  is the theoretical formula, where  $\xi = (x - x_0)/x_0$  is the non-dimensional length,  $x_0$  is the transition point, and  $x_l$  is

the transition length [6].

The results here suggest that boundary layer transition to turbulence occurs at the point of  $x = 0.2$  m from the front of the model, where the Reynolds number based on the displacement thickness is about  $Re^* = 500$ . Then, the shape factor tends to fall off to an almost constant value of  $H_{12} = 1.4$ , and the intermittency factor tends to rise to almost  $\Gamma = 1$ , representing fully developed turbulence. The boundary layers above the model surface in a free-stream velocity of  $U = 150$  km/h or more therefore yield transition from laminar to turbulence at the point of  $x = 0.2$  m or less. These results were confirmed by spatial direct numerical simulation [7].

## 2.2 Model launch experiment

As the boundary layer of the model in a high-speed region is assumed to be almost turbulent (a significant candidate as a noise source), we investigated aerodynamic sound radiated from the same model using the model launch apparatus at the RTRI as shown in Fig. 4. This apparatus is usually used to investigate compression wave formation in tunnel conditions [8]. The train model is projected by means of a four-stage friction drive involving four pairs of vertically aligned wheels, and is guided along a 5-mm-diameter taut steel wire. Small permanent magnets inserted into the model and two wire loops placed along the guide wire are used to measure the model's speed through magnetic field detection as it passes. The maximum possible launch speed is approximately 500 km/h. Pressure variations are measured by four precision sound-level meters (Rion NL-32, frequency response 20 Hz – 20 kHz), at distances of 0.05 m, 0.1 m, 0.2 m and 0.4 meters from the central axis of the model.

Figure 5 (a) shows the results of pressure variations obtained in the experiment. The experimental waveform is similar to the actual waveform of field measurement [4]. However, the magnitude of the experimental waveform of  $P_{w,a}$  is much smaller than that of the actual waveform because of the difference between experimental and field conditions in scale.

Figure 5 (b) shows the power spectral density obtained in the experiment; the thin line indicates background noise from the launch apparatus, and the hatched area indicates sound above the background noise. There is thought to be a law of similarity for the relationship between the scale and the frequency. The typical frequencies of  $P_f$  and  $P_{w,a}$  are given by

$$F_f \propto \frac{U}{r} \quad (3)$$

$$F_{w,a} \propto \frac{U}{\delta} \quad (4)$$

where  $F_f$  is a typical frequency for  $P_f$  given approximately by potential theory [9], and  $F_{w,a}$  is a typical frequency for  $P_{w,a}$  estimated from the thickness of the turbulent boundary layer around the model as shown in Fig. 3.

Using (3) and (4), the typical sound frequencies of the model experiment can be converted to corresponding respective frequencies for real scale low-frequency noise. Comparing the calculated values of  $F_f$  and  $F_{w,a}$  listed

in Table 2, the experimental frequencies are found to be close to the actual low-frequency noise obtained in past field measurements. Accordingly, the experiments using a simple-shape model can be thought to simulate the aerodynamically generated low-frequency noise of an actual train, and the turbulent boundary layers around the vehicle can be considered a key factor in determining the value of  $P_{w,a}$ .

Figure 6 (a) shows the distance attenuation of the magnitude of  $P_f$  and  $P_{w,a}$  where the horizontal axis represents the baseline distance from the central axis of the model to each microphone, and the magnitude of  $P_f$  and  $P_{w,a}$  are distinguished by an appropriate signal filter from the pressure waveform. According to the dominant frequencies estimated from the frequency analysis shown in Fig. 5 (b), the cut-off frequencies of the low-pass filter

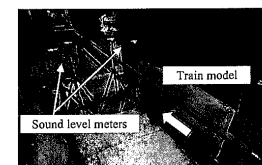


Fig. 4 Experimental setup of the axisymmetric model train at the model launch facility

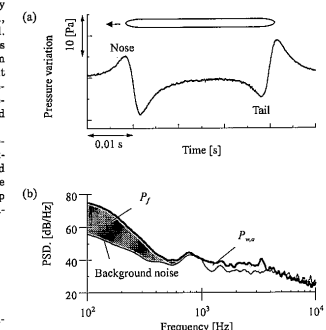


Fig. 5 Results of the model launch experiments for (a) the pressure waveform, and (b) power spectral density during the model's passage. The thin line indicates background noise from the launch apparatus, and the hatching indicates sound above the background noise.

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Table 2 Calculated frequencies from model experiment by Eqs. (3) and (4)

	$F_f$	$F_{w,a}$
Experimental results $U = 300 \text{ km/h}$ , $r = 0.2 \text{ m}$	$< 500 \text{ Hz}$	$1 \text{ k} \sim 4 \text{ kHz}$
Converted to actual frequencies $U = 270 \text{ km/h}$ , $r = 29 \text{ m}$	$< 3 \text{ Hz}$	$9 \sim 36 \text{ Hz}$

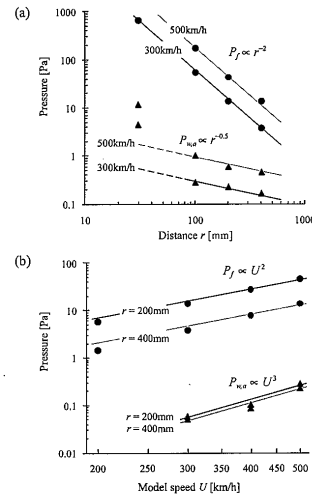


Fig. 6 Characteristics of the magnitude of  $P_f$  and  $P_{w,a}$  as obtained in the model launch experiment; (a) distance attenuation, and (b) velocity dependency

for  $P_f$  were set to 500 Hz, and those of the band-pass filter for  $P_{w,a}$  were set to 800 – 5,000 Hz. Since the waveform through the signal filter for  $P_f$  exhibits a wave pattern showing a positive pulse followed by a negative pulse at the train nose part (their signs are reversed at the tail part), a magnitude of  $P_f$  is defined as the difference between a positive pulse peak and a negative pulse peak at the nose part. However, the waveform through the signal filter for  $P_{w,a}$  is observed as a continuous pressure wave while the train passes, so a magnitude of  $P_{w,a}$  is defined as the RMS value during train passage. As shown in Fig. 6 (a), the magnitude of  $P_f$  is propor-

tional to  $r^{-0.5}$ , and the magnitude of  $P_{w,a}$  is proportional to  $r^{-0.5}$ . The distance attenuation of  $P_f$  is equal to the coefficient of (1) obtained by potential theory, and the distance attenuation of  $P_{w,a}$  is similar to the theoretically derived coefficient of the acoustic line source. In addition, Fig. 6 (b) shows the velocity dependence of the magnitude of  $P_f$  and  $P_{w,a}$ , where the horizontal axis represents the model's launch velocity. The results show that the magnitude of  $P_f$  is proportional to  $U^2$ ; this velocity dependence corresponds to the theoretical coefficient of (1). Meanwhile, the magnitude of  $P_{w,a}$  is found to increase considerably in proportion to  $U^3$ , which suggests that  $P_{w,a}$  is attributable to an aerodynamically generated dipole sound source [10].

### 3. Field measurement

Field measurement was performed at two Shinkansen sites close to a viaduct and an embankment in an open-air section as shown in Fig. 7. Both tracks were straight, both roadbeds were of the non-ballasted slab type, and simple vertical sound barriers measuring about one meter in height or more were attached to both sides of the tracks. The measured train consisted of one set of six cars coupled with the other set of ten cars. Shapes and surface roughness of the two sets were basically the same, however the length of the cars and the wheelbase length of the bogies were different.

Low-frequency noise was measured with a specially manufactured sound-level meter for low-frequency (Rion XN-12A, frequency response: 0.2 – 1,000 Hz), and the measurement points were located on the ground several

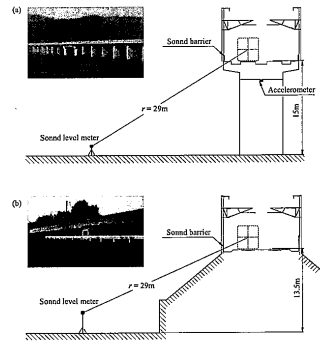


Fig. 7 Photograph and schematic images of the measurement sites in (a) the viaduct section, and (b) the embankment section

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dozen meters from the centerline of the down-track. In order to estimate the influence of noise radiation from the railway viaduct, vibration was also measured with an acceleration meter (Rion UV-05, frequency response: 1 – 10,000 Hz) on the lower surface of a concrete beam. All measured data were recorded in time-history format on a digital data recorder (Sony PC-216Ax, frequency response: DC – 5 kHz), from which it was possible to obtain a sound spectrogram and identify a coherence function between sound and vibration.

### 3.1 Results of field measurement

Figure 8 shows an ensemble averaged sound spectrogram with the same conditions at train speed  $U = 270 \text{ km/h}$  and a measurement distance of  $r = 29 \text{ m}$ , where the horizontal and vertical axes indicate the measurement time and frequency, respectively, the color shaded regions with color bar represent the magnitude of sound pressure level, and the frequency ranges of  $F_f$  and  $F_{w,a}$  are calculated from (3) and (4) by the typical frequency of the model experiment.

In these figures, infrasound values with a frequency less than 3 Hz are attributed to the  $P_f$  phenomenon, or pressure variations caused by moving quasi-steady pressure fields around the nose and tail parts of the train. Broadband noise in the range of 10 to 40 Hz is attributed to the  $P_{w,a}$  phenomenon, or noise aerodynamically

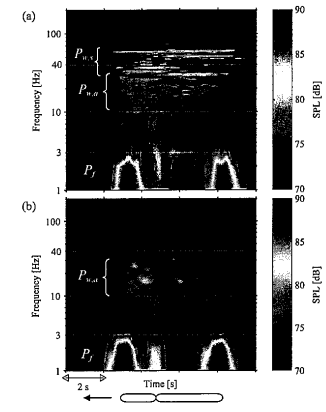


Fig. 8 Spectrograms of sound pressure in (a) the viaduct section, and (b) the embankment section;  $U = 270 \text{ km/h}$ ,  $r = 29 \text{ m}$

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generated from the train. In addition, for the viaduct section, several periods of continuous noise with a frequency less than 80 Hz added to  $P_{w,a}$  are attributed to the  $P_{w,s}$  phenomenon, or noise radiation from concrete railway viaducts. This is confirmed by the fact that the coherence function between sound and viaduct vibration is relatively high in accordance with the frequencies of  $P_{w,s}$ . Note that the frequencies of  $P_{w,s}$  at the front of the train are different from those at the rear because different vibration modes of the viaduct structure are caused by differences in the car length and the wheelbase length of the two sets.

### 3.2 Characteristics of low-frequency wayside noise

Figure 9 shows the actual measurements and the characteristics of low-frequency wayside noise estimated from both the field measurements and the model experiment, where  $L$  is the maximum sound pressure level (SPL) of low-frequency noise ( $F$ -weighted; flat in 1 – 100 Hz (11)) with a constant of 0.125 s for time weighting. Additionally,  $L$  is divided into the three categories of  $L_f$  (the SPL of  $P_f$ ),  $L_{w,s}$  (the SPL of  $P_{w,s}$ ), and  $L_{w,a}$  (the SPL of  $P_{w,a}$ ). A near field and a far field are distinguished by  $r/d \leq 512$  (where  $d$  is the equivalent circle diameter of the train cross-section) because the magnitude of  $L_f$  is related to  $r$ ,

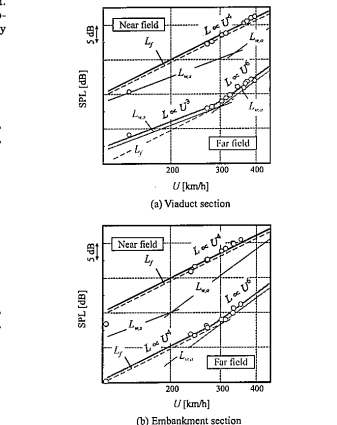


Fig. 9 Characteristics of low-frequency wayside noise for near field ( $r = 15 \text{ m}$ ) and far field ( $r = 45 \text{ m}$ ). Symbols "o" represent measured maximum sound pressure levels; lines are estimated characteristics of low-frequency wayside noise

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the measurement distance, and  $A_0 = \pi(d/2)^2$ , the cross-sectional area of the train, by (1).

By comparing the near field with the far field, it can be seen that  $L_f$  significantly affects the magnitude of  $L$  in the near-field range, and the influence of the type of site is negligible. Therefore, the low-frequency wayside noise of both the viaduct section and the embankment section tend to increase with  $L = L_f = U^4$ .

By contrast, the magnitude of  $L$  in the far-field range is affected by the type of site and the train's speed range. For speeds of around 300 km/h or less, low-frequency wayside noise in the viaduct section is larger than that in the embankment section in the far-field range because of the effect of  $L_{w,p}$  of the concrete structure. For speeds of around 300 km/h or higher,  $L_{w,p}$  gradually affects the magnitude of  $L$ , and both low-frequency wayside noise in the viaduct section and that in the embankment section tend to increase with  $L = L_{w,p} = U^6$ .

## 4. Conclusions

In this paper, the three major noise source mechanisms of high-speed trains have been discussed; pressure variations around the nose and tail parts of the train generated by train passage, aerodynamically generated low-frequency pressure waves emanating from the train itself, and noise radiation from vibrating concrete railway viaducts.

The measurement of higher-speed region showed that the most significant source of low-frequency noise in the far field is aerodynamically generated unsteady flow, which is analogous to a line source. Laboratory experiments using an axisymmetric train model indicated that the turbulent boundary layer developing on the train surface is a key issue in the mechanism behind low-frequency wayside noise.

## Acknowledgment

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## References

- [1] Kikuchi, K., Iida, M., Takasaki, T., and Takami, H., "Field measurement of wayside low-frequency noise emitted from tunnel portals and trains of high-speed railway," *Journal of Low Frequency Noise, Vibration and Active Control*, Vol. 24, No. 4, pp.219-231, 2005.
- [2] Ministry of the Environment of Japan, "Manual for measurement of low-frequency noise," 2000 (in Japanese).
- [3] Kikuchi, K. and Iida, M., "Simple numerical method to calculate pressure fluctuation due to train passage," *Transactions of the Japan Society of Mechanical Engineers, Series B*, Vol. 71, No. 706, pp. 2022-2029, 2005 (in Japanese).
- [4] Takami, H., Kikuchi, K., Maekawa, H., Kurita, T., and Wakabayashi, Y., "Low-frequency noise radiated from a high-speed train passing an open section," *Transactions of the Japan Society of Mechanical Engineers, Series B*, Vol. 73, No. 735, pp. 2275-2282, 2007 (in Japanese).
- [5] Nagakura, K. and Zenda, Y., "Prediction model of wayside noise level of Shinkansen," proceeding of *International Workshop Wave 2002*, pp. 237-244, 2003.
- [6] Dhawan, S. and Narashimha, R., "Some properties of boundary layer flow during the transition from laminar to turbulent motion," *Journal of Fluid Mechanics*, Vol. 3, pp. 418-426, 1958.
- [7] Watanabe, D., Takami, H., Maekawa, H., Kikuchi, K., Iida, M., and Suzuki, H., "Acoustic waves emanating from transitional structures in a compressible boundary-layer for high-speed train," presented at the *Thirteenth International Congress on Sound and Vibration*, 2006.
- [8] Ozawa, S. and Maeda, T., "Model experiment on reduction of micro-pressure wave radiated from tunnel exit," presented at *International Symposium on Scale Modeling*, Japan Society of Mechanical Engineers, Tokyo, July 18-22, 1986.
- [9] Howe, M. S., "On the infrasound generated when a train enters a tunnel," *Journal of Fluids and Structures*, Vol. 17, pp. 629-642, 2003.
- [10] Curle, N., "The influence of solid boundaries upon aerodynamic sound," *Proceedings of the Royal Society of London, Series A*, Vol. 231, No. 1187, pp. 505-514, 1956.
- [11] Iwahashi, K. and Ochiai, H., "Infrasound pressure meter and examples of measuring data," *Journal of Low Frequency Noise, Vibration and Active Control*, Vol. 20, No. 1, pp. 15-19, 2001.

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### Do wind turbines produce significant low frequency sound levels?

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## Summary

Wind turbines produce low frequency sounds, but it has not been shown this is a major factor contributing to annoyance. Sound from wind turbines involves several sound production mechanisms related to different interactions between the turbine blades and the air. Low frequency sound is predominantly the result of the displacement of air by a blade and of turbulence at the blade surface.

An important contribution to the low frequency part of the sound spectrum may be the result of the sudden variation in air flow the blade encounters when it passes the tower: the angle of attack of the incoming air suddenly deviates from the angle that is optimized for the mean flow.

This effect probably has not been considered important as the blade passing frequency is of the order of one hertz where human hearing is very insensitive. This argument however obscures a very relevant effect: the low blade passing frequency modulates well audible, higher frequency sounds and thus creates periodic sound. This effect is stronger at night because in a stable atmosphere there is a greater difference between rotor averaged and near-tower wind speed. Measurements have shown that more turbines can interact to further amplify this effect.

The effect is confirmed by residents near wind turbines who mention the same common observation: often late in the afternoon or in the evening the turbine sound changes to a more 'clapping' or 'beating' sound, the rhythm in agreement with the blade passing frequency. It is clear from the observations that this is associated to a change to a higher atmospheric stability. The increased annoyance has not been investigated as such, although there are indications from literature this effect is relevant. It is of increasing relevance as the effect is stronger for modern (that is: tall) wind turbines.

## Introduction

Modern wind turbines have electric power outputs up to 2 MW (increasing now to 5 MW) and have turbine heights of 80 to 100 meters (increasing to 120 m). In the European Union, producing 74% of the wind power in the world, by the end of 2002 23 GW has been installed, and this should increase to the European target of 40 GW for 2010, but already a capacity of 90 GW has been forecasted for that year [1]. As a result of this growth an increasing number of people are living near (projected) wind parks and have reason to inquire and perhaps be worried about their environmental impact. Visual impact, intermittent reflections on the turbine blades as well as intermittent shadows (sun behind rotating blades), and sound are usually considered potentially negative impacts.

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Wind turbines are also suspected to be a cause of low frequency noise, affecting people living nearby. This has been brought forward in the United Kingdom where opponents of wind parks state "current recommendations for noise evaluation near wind turbine sites completely exclude the measurement of low frequency sound" [2]. In a reaction the British Wind Energy Association denies this and accuses the other party "to misunderstand technical information, but be happy to use the material in inappropriate ways. One example of this is their persistent misuse of material on noise". [3].

Yet, a recent review for the British Department for Environment, Food and Rural Affairs states: "Infrasound exposure is ubiquitous in modern life (.....) common in urban environments, and as an emission from (.....) air movement machinery including wind turbines (.....). The effects of infrasound or low frequency noise are of particular concern because of its pervasiveness (.....) compared with other noise." [4]. Also, according to a project proposal from the Swedish Kungl Technical Highschool "there is a risk for low frequency sound from the large wind turbine farms that are planned both in Sweden and in other European countries" [5]. So, those who link wind turbines with low frequency sound are in expert company. But, does it affect nearby residents?

This paper explores the nature of (low frequency) wind turbine sound and explains why low frequencies may be relevant and not relevant at the same time, depending on perspective.

### Sources of wind turbine sound

There is a wealth of information on the nature, cause and power of turbine sound. A review resulting from a research programme of the European Union is given by Wagner *et al* [6]. A concise overview of the three sound source mechanisms relevant to this paper will be given here, preceded by an introduction on wind aerodynamics.

If an air flow is smooth around a (streamlined) body, it will generate little sound. For high speeds and/or over longer lengths the flow in the boundary layer (between body and main flow) becomes turbulent. As this leads to rapid velocity *changes* this will cause more sound with frequencies related to the rate of the velocity changes. A typical size for this turbulence is the boundary layer thickness.

As is the case for aircraft wings or propeller blades, a wind turbine blade is driven by lift generated by the air flow and performs best when lift is maximized and at the same time drag (flow resistance) is minimized. Both are determined by the angle of attack: the angle between the incoming flow and the chord (line between front and rear edge) of the blade. When the angle of attack increases from its optimal value the turbulent boundary layer grows in thickness and turbulence strength, decreasing power performance and increasing sound level. For an increasing angle of attack this eventually leads to stall: a dramatic reduction in lift. Also, the atmosphere itself is turbulent over a wide range of frequencies and sizes.

Atmospheric turbulence energy has a maximum at a frequency that depends on height and atmospheric stability; for wind turbine altitudes this frequency is of an order of magnitude of once per minute ( $\approx 0.01$  Hz), and the associated eddy (whirl) 'diameter' is of the order of magnitude of a several hundreds of meters [7]. Eddy diameter and turbulence strength decrease at increasing frequency and vanish because of viscous friction when they have reached the size of a millimeter.

Turbulent flow is the dominant cause of (audible) sound for modern wind turbines. There are several mechanisms whereby the sound actually is produced.

1. When a blade moves through the air, the air on the forward edge is moved sideways moving back again at the rear edge. So for a periodically moving blade the air is periodically forced, leading to 'thickness noise'. Normally this will not lead to a significant sound production.

However, when a blade passes in front of the turbine tower, it encounters a wind that is influenced by the tower: the wind is slowed down and is forced to move sideways around the tower. This means that quite suddenly the angle of attack changes and lift and drag change abruptly. The change in mechanical load will increase thickness sound at the rate of the blade passing frequency  $f_b$  ( $f_b$  is the turbine rotation frequency multiplied by the number of blades). As the movement is not purely sinusoidal, there are harmonics with frequencies  $k \cdot f_b$  where  $k$  is a (small) integer. As  $f_b$  typically has a value of approximately 1 Hz and harmonics may occur up to 10 - 20 Hz, this sound is in the infrasound region. Another consequence is that high frequency sound will also increase abruptly because of increased turbulence due to the sub-optimal angle of attack, creating the typical swishes superimposed on the constant noisy sound of a wind turbine.

2. Because of atmospheric turbulence there is a random movement of air superimposed on the average wind speed. The contribution of atmospheric turbulence to wind turbine sound is named 'in-flow turbulence noise' and is broad band sound stretching over a wide frequency range.

For turbulent eddies larger in size than the blade this may be interpreted as a change in the direction and/or velocity of the incoming flow, equivalent to a deviation of the optimal angle of attack. This leads to the same phenomena as in 1., but changes will usually be less abrupt.

For turbulent eddies the size of the chord length and less, effects are local and do not occur coherently over the blade. When the blade cuts through the eddies, the movement normal to the wind surface is reduced or stopped, given rise to high accelerations and thus sound.

3. High frequency sound is due to several flow phenomena at the blade itself or in the turbulent wake behind a blade ('airfoil self-noise'). It increases when induced turbulence increases, e.g. because of higher speed or of irregularities (scratches, dirt, insects) on the blade surface. It is essentially broad band sound, but if the turbulence can lock into a fixed length (such as a slit or cut parallel to the trailing edge), a specific frequency can become prominent, resulting in tonal sound.

Sound originating from the generator or the transmission gear has decreased in level in the past decade and has now become irrelevant if considering annoyance for residents.

### Measured wind turbine sound spectra

In the summer of 2002 wind turbine sound has been recorded in and near wind park Rhede on the German-Dutch border. The park has a straight row of ten ca. 300 m spaced turbines parallel to the border and a less regular, somewhat uneven spaced row of seven turbines approx. 400 m behind the first row. Each turbine is 100 m high (hub height) with a blade length of 35 m, and produces nominally 2 MW electricity. It proved that the sound level, determined by the rotation speed of the turbines, depended on atmospheric stability and was not well predicted at evening and night hours by the usual reference wind speed measured at 10 meter altitude [8].

In figure 1 1/3 octave band spectra of the recorded sound have been plotted. The sound was recorded on a TASCAM DA-1 DAT-recorder with a precision Sennheiser microphone. The sound was then sampled in 1-second intervals on a Larson Davis 2800 frequency analyzer. The frequency response of the measurement chain is within 3 dB for frequencies above 4 Hz. From 1 to 4 Hz the frequency response is not accurately known (this has never been a necessity in our work). The spectra were determined from recordings (appr. 5 minutes each) taken with the microphone just above a hard surface at ground level at 100 m from two different turbines (plotted levels are measured Leq minus 6 dB correction for coherent reflection against the surface), and from a recording 1.5 m above a paved terrace and 2 m in

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front of the façade of a dwelling at 750 m distance from the nearest row of turbines (measured Leq minus 3 dB correction for incoherent reflection at the façade).

In each part of figure 1 200 spectra (spaced 1 sec) as well as the energy averaged spectrum have been plotted. Also the correlation coefficient  $\alpha$  between all unweighted 1/3 octave band levels and the overall A-weighted sound levels has been plotted for each 1/3 octave band frequency. It is clear from the spectra that most energy is found at lower frequencies. This does not imply it is relevant for hearing as human hearing however is relatively insensitive at low frequencies. Indeed, the correlations show that most audible energy near the turbines is contained in the 1/3 octave band levels with frequencies from 400 through 3150 Hz (where  $\alpha > 0.4$ ). For the sound at the façade this is one octave lower (200 - 1600 Hz) because higher frequencies were better absorbed and now contribute less to the sound energy as they do near the turbines.

In figure 2 thirteen more detailed 1-second 1/3 octave band spectra have been plotted from the sound on the façade (see figure 1). Although the bandwidth should be taken smaller to detect the harmonics of the blade passing frequency  $f_b = 1$  Hz, the first harmonic at 2 Hz is clearly visible. A more detailed spectrum from a single turbine is given by Betke *et al* [9].

In figure 3 the three average spectra from figure 1 have been repeated, and the median hearing threshold for otologically selected young adults (according to ISO 226 [10]) has been added as well as the hearing threshold for the best hearing 10% of this group (10 percentile) which is 7 to 8 dB below the median level. It is clear that the sound below appr. 20 Hz must be considered inaudible for even well hearing people, even when one stands close to the turbine. Sound levels above the low frequency range but below appr. 1000 Hz are dominant with respect to audibility.

From figure 3 it is clear that sound levels at 100 m from a turbine (the two upper spectra) and at a location 750 km away from the first row of turbines are of comparable level at infrasonic frequencies; in fact the level differs only 4 dB. Although at the larger distance the sound level of a single turbine decreases, this is counterbalanced by the fact that more turbines contribute. At higher frequencies the same is true, but at increasing distance more sound energy is lost because of absorption.

The spectra in figure 3 are divided in three regions. For frequencies below 10 Hz the sound is dominated by thickness noise associated with the blade passing frequency (and harmonics). Then, in the higher infrasound region and upwards, where the level falls less steeply, in-flow turbulence is the dominant sound producing mechanism. Gradually, at frequencies above 100 Hz, airfoil self-noise is becoming the most dominant source, declining only at high frequencies of several kHz.

#### Impulsiveness

Wind turbine sound is not usually considered to be impulsive, as it has a more or less constant level due to the essentially random nature of the sound production mechanisms. Although there are periodic audible swishes, these are no equal to 'real impulses' like hammering or gun shots.

However, in a stable atmosphere the periodic swishes are louder than in daytime and residents use words like clapping, beating or thumping to describe the character or the sound. In the case of the Rhede wind park, the beating can be heard clearly at distances of at least up to 1 km and at night one can use it to determine the rotational speed of the turbine. So perhaps wind turbines can produce impulsive sound, but only in specific atmospheric conditions: the atmosphere must be stable. To understand this we must understand the implications of a stable atmosphere with respect to wind, the matter driving wind turbines.

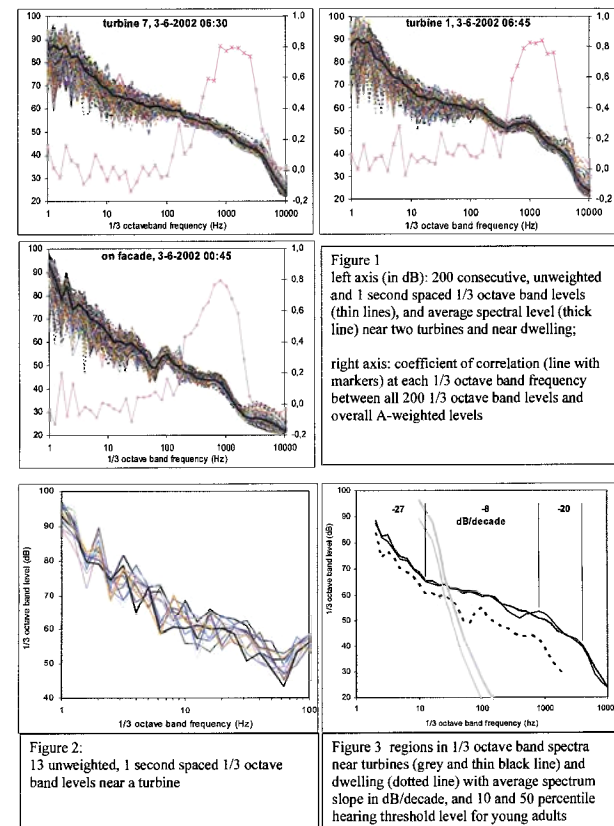


Figure 2:  
13 unweighted, 1 second spaced 1/3 octave  
band levels near a turbine

Figure 3: regions in 1/3 octave band spectra  
near turbines (grey and thin black line) and  
dwelling (dotted line) with average spectrum  
slope in dB/decade, and 10 and 50 percentile  
hearing threshold level for young adults

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The wind speed  $v_h$  at height  $h$  in the atmosphere can be written as:

$$v_h = v_{ref}(h/h_{ref})^m \quad (1)$$

where  $v_{ref}$  is the wind speed at a reference height  $h_{ref}$  (usually 10 m). The exponent  $m$  depends upon atmospheric stability. For a neutral atmosphere, occurring under heavy clouding and/or in strong winds, air buoyancy dominates thermal effects and  $m$  has a value of appr. 0.2. In an unstable atmosphere, as is usual in daytime (if not neutral),  $m$  has a value of appr. 0.1. In a stable atmosphere  $m$  should theoretically reach values up to a maximum of  $1/2\sqrt{2}$ , describing a parabolic wind profile corresponding to laminar flow. Our Rhede measurements yielded values of  $m$  up to 0.6 [8]. A sample from data from the Royal Dutch Meteorological Institute KNMI [11] shows that indeed this theoretical maximum can be reached: in ten out of twelve midnight half hours (averages over 0:00 – 0:30 GMT) of each first night of the month there was a temperature inversion in the lower 120 m, indicating atmospheric stability. Of these in six cases the temperature increased with more than 1 °C from 10 to 120 m height and the exponent  $m$  (calculated from (1):  $m = \log(v_{80}/v_{10})/\log(8)$ ) was 0.43, 0.44, 0.55, 0.58, 0.67 and 0.72 (we expect to do a more thorough analysis on more data to obtain statistically relevant long-term results). In the following text we will use a value  $m = 0.1$  for an unstable atmosphere and  $m = 0.6$  for a stable atmosphere. These values will be used for altitudes between 10 and 120 m. It is probable that the wind profile above 120 m will not follow formula (1), as eventually a more or less constant wind speed (the geostrophic wind) will be attained, perhaps, in a stable atmosphere, after a decrease when the top of a 'low level jet' at about 100 m height has been reached. Because of this, the optimal height for a windturbine from an energetic point of view will probably be about 100 m.

Effects depend on wind turbine properties (such as speed, diameter and height). We will use typical dimensions of a modern 1.5-2 MW wind turbine: hub height 80 m, rotor diameter 70 m and rotational speed increasing with wind speed to a maximum value of 20 rpm.

Now there are two reasons why the periodic swishes acquire a more impulsive character in a stable atmosphere relative to an unstable or neutral atmosphere.

1- Rotational speed will be determined by a rotor averaged wind speed, but the difference in wind speed between the upper and lower part of the rotor increases. Suppose the wind speed at hub height is  $v_{80} = 8$  m/s. Then in daytime ( $m = 0.1$ ) the wind speed at the lowest point of the rotor would be  $v_{45} = 7.6$  m/s, at the highest point  $v_{115} = 8.3$  m/s. The difference in wind speed over the rotor of 0.35 m/s causes a change in angle of attack of only 0.25° (both plus or minus relative to average value). A very slight vertical tilt of the rotor can offset this. In nighttime ( $m = 0.6$ ) however, at the same wind speed at hub height,  $v_{45}$  is 5.7 m/s and  $v_{115}$  9.9 m/s, so the difference in wind speed over the rotor and the change in angle of attack are now 6 times as large: 2.1 m/s and 1.5°, respectively. As a consequence there will be more airfoil self-noise.

A further effect is that there is a greater mismatch between optimum and actual angle of attack when the blade passes the mast (where there was already a mismatch due to the tower), causing higher blade loading and more turbulence. This effect is readily audible when night falls: the blades start clapping or beating at the blade passing frequency. The effect is stronger when stability increases, and also when wind speed at hub height increases up to the point where friction turbulence overrides stability and the atmosphere becomes neutral.

2- As was shown earlier [8], in a stable atmosphere wind turbines can run almost synchronously because the relative absence of turbulence leads to less random motion

superimposed on the constant (average) wind speed at each turbine. Turbines in a wind park therefore experience a wind that is more constant over greater distances. As a result they tend to react the same, that is: their turbine speeds are more nearly equal. This is confirmed by long term measurements by Nanahara *et al* who analysed coherence of wind speeds at locations at increasing distances in two coastal areas [12]. At night hours wind speeds at different locations were found to change more coherently than they did at daytime [13]. The difference between night and day hours was not very strong, probably because just time of day is a helpful, but not sufficient indicator for stability, especially not near sea and over all day lengths in an entire year.

Because of the *near-synchronicity* of several turbines, sometimes two are in phase and the blade passing pulses coincide, and then go out of phase again. The same can happen for three and perhaps more turbines. Exact synchronicity would not give the same effect, because it is improbable that an observer would hear these pulses at the same time. Because of near-synchronicity however, an observer will hear coinciding pulses for part of the time. Synchronicity here refers to the sound pulses of the different turbines at the location of the observer: pulses synchronize when they arrive simultaneously. This does not imply that the rotors are in phase: in that case the pulses would not arrive simultaneously unless the turbines would be at a distance to the observer equal to the distance sound propagates in one pulse repetition time or a multiple.

Both effects, the wind speed gradient and the near-synchronicity, increase the level of the sound heard when the blades pass the tower. The extra blade loading itself is not audible because of the high hearing threshold at the very low blade passing frequency. But the effect of added induced turbulence increases the levels at frequencies that already were dominating the best audible part of the sound, that is, at 750 m distance, at 200 – 1600 Hz (= range with high correlation in figure 1). When the pulses at the Rhede wind park synchronize, the level of the 800 Hz 1/3 octave band (best correlated to audibility: see façade spectrum in figure 1) increases with 10 dB, whereas the total A-weighted level increases with 5 dB. In general the height of the pulse will depend on the change in angle of attack and the distances of the wind turbines relative to the observer: the beat due to several turbines will reach higher pulse levels when more turbines are at approximately equal distances and contribute equal immission levels. The clapping or beating is thus at well-audible frequencies and has a repetition rate equal to the blade passing frequency.

### Window rattling

Although infrasound levels from large turbines at frequencies below 20 Hz are too low to be audible, they may cause structural elements of buildings to vibrate. The vibrations may produce higher frequency, audible sound.

Windows are usually the most sensitive elements as they move relatively easy because of the low mass per area. Perceptible vibrations of windows may occur at frequencies from 1 to 10 Hz when the incoming 1/3 octave band sound pressure level is at least appr. 52 dB [14]; at higher or lower frequencies a higher level is needed to produce perceptible vibrations. As can be seen in figures 1 – 3 sound pressure levels above 60 dB at frequencies below 10 Hz occur close to a turbine as well as at 750 m distance and further.

A window vibrating at the impinging frequency transmits this frequency to the indoor air. If this does not coincide with a room resonance, the sound will not be louder than outdoors. For rooms in dwellings with a greatest dimension of 10 m, resonance frequencies are higher than appr. 15 Hz and thus cannot coincide with relevant harmonics of  $f_b$ , the blade passing frequency.

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However, a window pane itself may have a resonant frequency of, e.g., 40 Hz and a frequency of 10 Hz then may sustain a window pane resonance, thus transforming inaudible infrasound to audible higher frequencies. Also, a loosely fitted window may move to and fro and being stopped by the window frame vibrates at higher frequencies radiated into the room.

**Conclusion**

Infrasonic harmonics of the blade passing frequency from modern, tall wind turbines must be considered inaudible. Low frequency in-flow turbulence sound may be audible, but wind turbine sound is loudest at medium to high frequencies. This readily audible sound is caused by atmospheric and induced turbulence at the blade surface. The level of this medium/high frequency turbulent sound varies at the rate of the blade passing frequency, which causes the typical swishing sound of a modern wind turbine.

When the atmosphere becomes more stable, which is usual at night when there is a partial clear sky and a light to moderate wind (at ground level), there is an important change in wind profile affecting the performance of a modern, tall wind turbine. The airflow around the blade then changes to less than optimal, resulting in added induced turbulence. This effect is strongest when the blades pass the tower, causing short lasting, higher sound levels at the rate of the blade passing frequency. In a wind park these pulses can synchronize, leading to still higher pulse levels for an observer outside the park. The resulting repetitive pulses change the character of the wind park sound and must be expected to cause added annoyance.

**References**

- 1- "Windpower keeps its promises", New and Renewable energies: Wind energy, [http://europa.eu.int/comm/energy/res/sectors/wind\\_energy\\_en.htm](http://europa.eu.int/comm/energy/res/sectors/wind_energy_en.htm), visited June 16, 2004
- 2- More attention must be paid to the harmful effects, Western Morning News, 6 January 2004; <http://www.countryguardian.net/WMN%20re%20noise.htm>
- 3- <http://www.britishwindenergy.co.uk/ref/cgnoise.html>, visited June 16, 2004
- 4- Geoff Leventhal: "A Review of Published Research on Low Frequency Noise and its Effects", Report for Defra, 2003
- 5- H. Bodén, M. Boue, M. Åbom: "Sound from sea based wind turbines (TRANS)", <http://www.kth.se/forskning/pocket/project.asp?id=20106>, visited June 16, 2004
- 6- S. Wagner, R. Bareiss, G. Guidati: "Wind turbine noise", Springer, Berlin, 1996
- 7- E.L. Petersen, N.G. Mortensen, L. Landberg, J. Høstrup, H.P. Frank: Wind power meteorology", Wind Energy 1 (1998), pp. 2-22
- 8- G.P. van den Berg: "Effects of the wind profile at night on wind turbine sound", Journal of Sound and Vibration, in press
- 9- K. Betke, H. Remmers: "Messung und bewertung von tieffrequentem Schall", presented at DAGA'98, Zürich, 1998
- 10- ISO: ISO 226: "Acoustics-Equal Loudness contours for otologically normal listeners, part 1"
- 11- A.P. van Ulden, J.G. van der Vliet en J. Wieringa: "Temperature and wind observations at heights from 2m to 200m at Cabauw in 1973", 1976, De Bilt
- 12- T. Nanahara, M. Asara, T. Sato, K. Yamaguchi, M. Shibata, T. Maejima: "Smoothing effects of distributed wind turbines, part 1", Wind Energy 2004 (7), pp. 61-74
- 13- T. Nanahara: personal communication by e-mail, June 14, 2004
- 14- Figure in [6] taken from D. G. Stephens: "Evaluation human exposure noise large wind turbines", NASA-TM-83288, March 1982



Converting the UK traffic noise index  $L_{A10,18h}$  to EU  
noise indices for noise mapping

by P G Abbott and P M Nelson

PR/SE/451/02  
[EPG 1/2/37]

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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CONVERTING THE UK TRAFFIC NOISE INDEX  $L_{A10,18h}$  TO EU  
NOISE INDICES FOR NOISE MAPPING

by P G Abbott & P M Nelson (TRL Limited)

Prepared for: Project Record: EPG 1/2/37 – Adapt UK Road Traffic Noise  
Calculation Method For Noise Mapping  
Client: AEQ Division, DEFRA  
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### EXECUTIVE SUMMARY

The Commission of the European Communities has published proposals to establish a common EU framework for the assessment and management of exposure to environmental noise. It requires Member States to produce noise exposure information in the form of strategic noise maps that use common noise indicators that have also been proposed by the EU. An objective of this approach is to provide a means of assessing various noise control strategies on an area wide basis. It is intended that the strategic noise maps will be published, thereby allowing responsible authorities to compare the different noise control methods adopted. It is hoped that this exchange of information will encourage a greater understanding of the problem and will encourage the development of best practice across the community.

The Commission recognised that not all Member States have a noise prediction method for assessing environmental noise based on the EU noise indices. Therefore, it has made provisions to allow suitable interim computation methods to be used prior to the development of a common EU method. Two options have been recommended: Firstly, member states would be allowed to use existing national methods provided that they are adapted to compute the recommended EU noise indices. Secondly, if there is no suitable existing national method or an existing model that can be adapted, the EU recommends the French national computation method 'NMPB' for the assessment of road traffic noise.

In the UK, the environmental assessment of road traffic noise is normally based on the procedures described in the publication 'Calculation of Road Traffic Noise' (CRTN) (except for new or altered roads for the purposes of the Noise Insulation (Scotland) Regulations 1975). The noise index derived from this prediction method is very different from the indices proposed by the EU. A decision has to be made therefore whether to attempt to adapt the CRTN method to produce the required noise indices or whether to adopt the proposed French method or a similar new method in the UK for noise mapping purposes. In order to inform this decision the AEQ Division of DEFRA and the devolved administrations have commissioned TRL to examine the options available.

In this study the various options are reviewed and compared to establish advantages and disadvantages of each approach. In addition, a particular objective is to determine correction formulae to CRTN to produce outputs in the form of the EU indices and to establish the potential accuracy of this approach. The analysis does not consider how barrier attenuation or varying wind speed and direction may influence noise levels and the subsequent effects on the relationship between  $L_{Aeq}$  and  $L_{A10}$ . However, it is pointed out that the relative effect of screening on the different noise indices is likely to be small in practice. Consequently, it is reasonable to expect that the relationships derived for open site conditions can also be applied to sites where screening is involved. The EU requirement to predict long-term average noise levels based on average wind conditions rather than the moderately adverse conditions implicit in the CRTN formulation will tend to overestimate EU indices, particularly at locations where negative wind vectors predominate.

It was found that using either the French 'NMPB' method or a similar method derived by the Noise Advisory Council as an interim computation method would pose significant problems. The main limitation is the lack of appropriate vehicle noise input data particularly for roads where vehicle speeds fall below 80 km/h.

It is suggested that for UK conditions the best interim approach is to adapt CRTN by applying an 'end correction' to obtain the relevant EU indices from calculated values of  $L_{A10}$ . The preferred approach

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relies on determining hourly values of  $L_{A10}$  using the CRTN<sup>1</sup> method and then converting these values to equivalent values of  $L_{Aeq}$  using the relationship

$$L_{Aeq,1h} = 0.94 \times L_{A10,1h} + 0.77 \text{ dB}$$

except for non-motorway roads when hourly traffic flows are below 200 vehicles per hour during the period 24:00 to 06:00 hours, when the relationship

$$L_{Aeq,1h} = 0.57 \times L_{A10,1h} + 24.46 \text{ dB}$$

should be used.

The converted values obtained for the full 24 hours can then be used to derive the values of  $L_{den}$  and  $L_{night}$  as required by the EU.

For situations where hourly values cannot be determined, due to the absence of detailed hourly traffic information but where traffic data for the required period indices is known or can be determined, an alternative method is provided. This allows CRTN to be used to produce values of  $L_{A10,18h}$  which are then converted to  $L_{Aeq,18h}$  and then subsequently to the component EU noise indices using the relevant period traffic data.  $L_{den}$  is then determined from these component values.

A third method is provided that can be used to determine the EU indices where additional traffic information is not available. The method allows CRTN to be used to produce values of  $L_{A10,18h}$  which are then converted directly to the EU indices. However, this method relies on the assumption that different road types will, on average, produce a reasonably consistent diurnal flow pattern. For roads where significant deviations in the average conditions occur then errors in conversion may result.

It is concluded that adapting CRTN in the manner described provides the basis for an interim computation method that will comply with the EU Directive relating to the assessment and management of environmental noise.

most exposed façade and 4 m above the ground and that reflection effects from the façade are ignored.

<sup>1</sup> For the purposes of noise mapping, the EU Directive assumes the assessment point is at 2 m in front of the  
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CONVERTING THE UK TRAFFIC NOISE INDEX  
 $L_{A10,18h}$  TO EU NOISE INDICES FOR NOISE MAPPING

ABSTRACT

The Commission of the European Communities has published a proposal to establish a common EU framework for the assessment and management of exposure to environmental noise. It requires Member States to publish noise exposure information in the form of strategic noise maps that use the common indicators recommended by the EU. The AEQ Division of DEFRA and the devolved administrations have commissioned TRL to advise on the development of an interim computation method for possible use in the UK which would comply with the proposed Directive for noise mapping purposes. This Report examines the various options and makes recommendations.

1 INTRODUCTION

The Commission of the European Communities has published a proposal to establish a common EU framework for the assessment and management of exposure to environmental noise (Commission of the European Communities, 2000). The objectives of the proposed Directive are to harmonise noise indicators and assessment methods for environmental noise. It requires Member States to produce noise exposure information in the form of strategic noise maps using the common indicators recommended by the EC (Commission of the European Communities, 1996). An objective is to provide a means of assessing various noise control strategies on an area wide basis. It is intended that noise maps will be published, thereby allowing responsible authorities to compare the different approaches adopted. It is hoped that this exchange of information will encourage a greater understanding of the problem and will encourage the development of best practice across the community.

The proposed Directive states that all Member States shall provide strategic noise maps approved by competent authorities for all agglomerations with more than 250,000 inhabitants and for all major roads, railways and airports. Recent European Council negotiations suggest that the date for completion of the maps under the proposed Directive may be set for 2007, however, DEFRA intends to complete a first round of mapping by the end of 2004.

The Commission recognised that not all Member States have a noise prediction method for assessing environmental noise based on the EU noise indices. Therefore, it has made provisions to allow suitable interim computation methods to be used prior to the development of a common EU method. Two options are included:

- (a) Adaptation of existing national methods. Member States would be allowed to use existing national methods providing they are adapted to compute the recommended EU noise indices.
- (b) Temporary computation methods. If there is no suitable existing national method or an existing model that can be updated, the Directive recommends the French national computation method 'NMPB' for the assessment of road traffic noise (CETUR, 1996). This recommendation followed a review of national prediction methods carried out by TRL for the Commission (Morgan et al, 2000). For input data to this method concerning source emission levels, reference is made to an earlier prediction method (CETUR, 1980).

In the UK, the environmental assessment of road traffic noise is based on the procedures described in the publication 'Calculation of Road Traffic Noise' (CRTN) (Department of Transport et al, 1988)

(except for new or altered roads for the purposes of the Noise Insulation (Scotland) Regulations 1975). The noise index derived from this prediction method is very different from that proposed for the EU. The UK index is based on a statistical description of the time varying sound levels whereas the EU indicators are based on a summation of sound energies. In addition, the indices refer to different periods of the day. The UK index assesses noise over the period 06:00 to midnight whereas the proposed Directive assesses the noise over the full 24 hour period with different weightings applied depending on the time of day.

For the UK to comply with the proposed Directive in providing the relevant strategic noise maps an interim computation method needs to be developed. This report considers the various options available. In particular, it examines the possibility of adapting CRTN to produce outputs in the form of the EU indices. Two issues not considered in detail in this study are;

1. the effect of average annual meteorological conditions, compared with the situation where the winds are light and have a positive wind component in the direction from the road towards the receptor as assumed in CRTN and,
2. the differences in the screening effect of barriers on the  $L_{Aeq}$  as compared with the  $L_{A10}$ .

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## 2 COMPARISON OF NOISE SCALES AND INDICES

As mentioned earlier, in the UK the noise index  $L_{A10,18h}$  dB is currently used to assess the impact of traffic noise. This has been the preferred index since the early 70's when it was shown that it offered a reasonably good correlation with average community annoyance/bother (Morton-Williams et al, 1978). Its introduction in UK legislation also pre-dated the development of equipment that could simply measure acoustic energy-based noise measures such as  $L_{Aeq}$ . At that time this fact clearly helped to establish  $L_{A10,18h}$  as both the most appropriate and the most practical measure to use to assess traffic noise impacts.

With the advent in the early 80's of instrumentation that could measure acoustic energy based measures most other nations now use indices based on  $L_{Aeq}$  to assess all forms of transport noise including that from road traffic. This is particularly the case in the European Union where the UK is now alone in its use of  $L_{A10,18h}$  for road traffic noise assessment. While this situation is not a major concern when dealing with noise problems such as the assessment of sound insulation compensation, it is becoming increasingly difficult to continue with the current practice of using  $L_{A10,18h}$  when dealing with the noise issues raised by the European community, such as the generation of strategic noise maps.

Since the commencement of noise mapping is imminent, there is clearly an urgent need to change UK practice for this application, by adopting the noise indices required by the Directive, which are based on  $L_{Aeq}$ . A step in this process is to establish whether there is a simple relationship between the two indices. If such a relationship could be established then simply converting  $L_{A10,18h}$  values using an 'end correction' to CRTN calculations could satisfy the requirements of the EU.

This section gives a brief description of the fundamental differences between the various noise descriptors used in the literature including the noise indices used in the UK and those recommended by the EU. This section also contains an overview of published research where various indices have been compared.

## 2.1 DEFINITIONS OF LEVELS, SCALES AND INDICES

Initially it is important to establish the differences between noise levels, scales and indices or ratings since the relationships between them will vary depending on the formulation used.

Noise level is the fundamental measure used subsequently to construct scales and indices. The objective is to obtain a physical measure of sound level that correlates well with the subjectively assessed noisiness of the sound. Experience has shown that the measure should emulate the variation of sensitivity with frequency of the human hearing system. Clearly for most noise sources, the level will vary with time although in defining a noise level, time is not included in the description. The 'A' weighted level is the most commonly quoted noise level used in environmental acoustics. Noise levels measured using 'A' weighting are normally expressed as  $L$  dB(A) or more commonly these days as  $L_A$  dB.

Noise scales combine noise level with time in some way. This may be the level exceeded for a given proportion of time, as in  $L_{A10}$  dB, or it might be an integration of level with respect to time, as in  $L_{Aeq}$  dB. Other forms have also been quoted in the literature but are less commonly used in a transport context.

Noise indices or ratings are created to provide an evaluation of noise in particular circumstances. Most commonly, indices are formed from the noise scales by merely defining the time period over which the scale applies. For example the  $L_{A10,18h}$  dB index refers to the specific time of day over which the noise scale should be averaged. A similar index in common use is the  $L_{Aeq,24h}$  dB which integrates the values of  $L_{Aeq}$  over a complete day.

The day/night level,  $L_{dn}$ , provides a further refinement. In addition to defining separately a day and night time period, it also applies a 10 dB 'penalty' to the night time level. This is an attempt to reflect what is generally felt to be a more intrusive period even though generally the noise levels are lower. Recently the EU has proposed two further indices for use in noise assessments,  $L_{den}$  and  $L_{night}$ . The subscript 'den' refers to defined 'day', 'evening' and 'night' time periods and as with  $L_{dn}$ , additional weighting values are attached to the levels occurring during the evening and night periods. As with the day/night level, the 'night' term is included to take account of possible sleep disturbance. The 'evening' term is added primarily to take account of interference with recreational activities.

2.1.1 UK traffic noise index  $L_{A10,18h}$ 

The traffic noise index  $L_{A10,18h}$  is based on the  $L_{A10}$  scale which gives a measure of the level of noise exceeded for 10% of a given time period. It is determined by the average of the values of  $L_{A10,1h}$  for each hour between 06:00 and 24:00 hours and may be expressed as:

$$\text{Traffic noise index, } L_{A10,18h} = \frac{1}{18} \sum_{t=0}^{t=23} L_{A10,t} \text{ dB(A)} \quad (2.1)$$

where  $t$  signifies the start time of the individual hourly  $L_{A10,1h}$  values in the period 06:00 – 24:00 hours.

Although the index does not specifically include the night time period (24:00 to 06:00 hours) it does include periods when people are most sensitive to sleep disturbance, i.e. those periods when people are trying to get to sleep and just before waking.

The index is based on a statistical description of the fluctuating noise level and is therefore dependent to some extent on the distribution of the individual vehicle passby events within the period of interest. It should therefore be understood that for low traffic flow conditions, the hourly variation in  $L_{A10,1h}$  will depend not only on variations in traffic parameters but on the random variation in vehicle passbys.

Methods for the prediction and measurement of  $L_{A10,18h}$  are published (Department of Transport et al, 1988).

## 2.1.2 EU noise indices

The EU has proposed two noise indicators  $L_{den}$  and  $L_{night}$ . These are based on the recommendations of the Working Group 'Indicators' which were approved by the Steering Group (Commission of the European Communities, 1999). The primary noise indicator is the day-evening-night level  $L_{den}$  that is an indicator of annoyance from long-term exposure to noise, whereas,  $L_{night}$  is an overall night-time indicator related to 'self-reported sleep disturbance' again from long-term exposure.

Both indicators are based on the scale  $L_{Aeq}$ . This is the equivalent sound level that if maintained would cause the same sound energy to be received as the actual sound over the same period. The equivalent sound level, determined from the actual sound levels during a period  $T$  is mathematically expressed as follows:

$$L_{Aeq,T} = 10 \times \log \left[ \frac{1}{T} \int_0^T 10^{L(t)/10} dt \right] \text{ dB(A)} \quad (2.2)$$

where  $L(t)$  is the A-weighted sound level at time  $t$  and  $T$  is the duration of the exposed period (seconds).

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From this basic definition the noise indicators  $L_{den}$  and  $L_{night}$  are defined as follows:

$$L_{den} = 10 \log_{10} \left[ \frac{1}{24} \left( \int_{07:00}^{19:00} 10^{L_{day}/10} dt + \int_{19:00}^{23:00} 10^{L_{evening}/10} dt + \int_{23:00}^{07:00} 10^{L_{night}/10} dt \right) \right] \text{ dB(A)} \quad (2.3)$$

where

$L_{day}$  is the A-weighted equivalent noise level over the 12-hour day time period from 07:00 to 19:00 hours

$L_{evening}$  is the A-weighted equivalent noise level over the 4-hour evening period from 19:00 to 23:00 hours

$L_{night}$  is the A-weighted equivalent noise level over the 8-hour night time period from 23:00 to 07:00 hours

$L_{evening}$  and  $L_{night}$  have a 5 and 10 dB weighting applied to each respectively to take account of the difference in annoyance due to the time of day.

The A-weighted equivalent noise level  $L_{night}$ , as defined above, is also used as a separate noise indicator in the Directive as a metric for the assessment of sleep disturbance but does not include the 10 dB weighting that is applied when determining the noise indicator  $L_{den}$ .

## 2.2 RELATIONSHIPS BETWEEN DIFFERENT NOISE SCALES AND INDICES

It should be clear from the above definitions that establishing conversion factors between different indices is not straightforward. In particular, the different time periods and, in some cases, the weightings applied to these time periods add both uncertainty and complexity to the process.

For these reasons, the comparison of noise scales and noise indices are treated separately in the following sections.

### 2.2.1 Comparison of $L_{A10}$ and $L_{Aeq}$ noise scales

#### (i) Gaussian distribution

In general, road traffic noise at a given location is the combination of the individual noise from each vehicle that comprises the traffic stream. Many investigations of traffic noise have involved sampling the time-varying sound level and grouping the values into noise level categories to form a distribution. It has been found that the distribution of noise levels approximates closely to a Gaussian or 'normal' distribution for conditions where the traffic flow exceeds about 100 vehicles per hour and is freely flowing. This fact is particularly convenient since it means that the distribution curve can be defined by just two parameters only, for instance, the median level,  $L_{A50}$ , and the standard deviation,  $\sigma$ , of the levels. This logic can also be extended to other statistical measures such as  $L_{A10}$  and energy integrated measures such as  $L_{Aeq}$ . Lamure (1975) has published several relationships of this form derived from the assumption that traffic noise distributions obey a Gaussian formulation. Of particular interest is the relationship shown in equation (2.4) below

$$L_{A10} - L_{Aeq} = 1.28\sigma - 0.115\sigma^2 \text{ dB} \quad (2.4)$$

For freely flowing traffic,  $\sigma$  is often in the range 2-5 (Don and Rees, 1985). By substituting these values into (2.4) the familiar approximation is obtained:-

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$$L_{A10} - L_{Aeq} \approx 3 \text{ dB} \quad (2.5)$$

#### (ii) Non-Gaussian distributions

In practice traffic may not be flowing freely and propagation can be affected by screening, reflection from facades etc, and varying ground effects. Under these conditions, variations from a true Gaussian distribution can be expected. In addition, traffic volume, speed and distance from the road can be important. For these situations, the simple conversion shown above in (2.5) may no longer be valid.

Driscoll et. al. (1974) presented one of the first investigations of the relationship between  $L_{A10}$  and  $L_{Aeq}$ . An analysis of several real and theoretical noise level distributions revealed that, on average,

$$L_{A10} = L_{Aeq} + 3.6 \text{ dB} \quad (2.6)$$

The Noise Advisory Council (1978), Reeves and Wixley (1986) and Huybrechts and Samuels (1998) have also established simplified linear transformations deduced from measured traffic noise levels. These are reproduced below;

$$\text{Noise Advisory Council: } L_{A10} = L_{Aeq} + 3 \text{ dB}^2 \quad (2.7)$$

$$\text{Reeves: } L_{A10} = L_{Aeq} + 4.2 \text{ dB} \quad (2.8)$$

$$\text{Huybrechts and Samuels: } L_{A10} = L_{Aeq} + (2.5 \text{ to } 3.5) \text{ dB} \quad (2.9)$$

While a linear transformation offers considerable advantages in terms of simplicity, it is clear that on detailed examination and under certain traffic and site conditions a simplistic linear conversion is not valid. For example, under low flow conditions,  $L_{Aeq}$  may actually exceed  $L_{A10}$  (Brown, 1989; Burgess, 1978). Other studies have revealed that, particularly for low flows, the relationship is dependent on both traffic volume and composition (Carter et al. 1992) and on the separation of vehicles, distance from the road and ground cover (Barry and Reagan, 1978). A theoretical maximum value of 19 dB(A) for the difference between  $L_{A10}$  and  $L_{Aeq}$  has been suggested by Lau et al (1989).

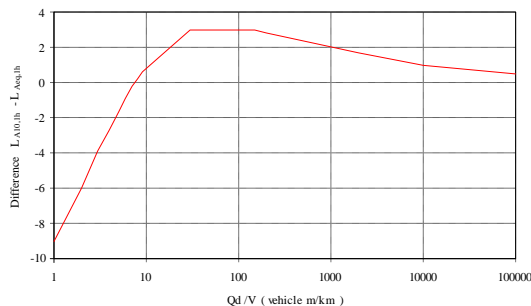
The range of possible conversion factors is illustrated in Figure 2.1. This shows the difference between  $L_{A10}$  and  $L_{Aeq}$  derived from a theoretical study carried out for the Federal Highway Administration in the USA (Barry and Reagan, 1978).

The Figure shows that for open site propagation (i.e. free from screening or reflection effects) the difference between  $L_{A10}$  and  $L_{Aeq}$  is a function of the traffic flow (Q veh/h), distance from the road (d m) and the average vehicle speed (V km/h). To understand this complex relationship it is helpful to imagine that as the function Qd/V decreases the noise will tend to consist of relatively long periods of low noise levels separated by short periods of relatively high noise levels. Alternatively, as the function increases the fluctuation in noise level reduces. For low flow situations and for positions located close to a road,  $L_{A10}$  is less affected by the occasional high noise level than  $L_{Aeq}$  and may lead, as suggested above, to  $L_{Aeq}$  exceeding  $L_{A10}$ . These conditions might occur at night or where the noise level distribution is characterised by infrequent very noisy events such as might occur near to an access road to a quarry carrying heavy vehicles but with low traffic volume.

<sup>2</sup> It should be noted that the conversion value quoted by the Noise Advisory Council is an average value. The study established that for 95% of situations, a range of 1-5 dB(A) would actually apply for the conversion factor.

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Figure 2.1: Theoretical difference between  $L_{A10,1h}$  and  $L_{Aeq,1h}$ 

As the function  $Qd/V$  increases, the difference between  $L_{A10}$  and  $L_{Aeq}$  increases rapidly and then becomes relatively stable with  $L_{A10}$  exceeding  $L_{Aeq}$  by about 3 dB, which, as noted earlier, is generally regarded as typical for most situations.

Further increases in the function  $Qd/V$  indicate that the difference between  $L_{A10}$  and  $L_{Aeq}$  reduces, with differences reaching about 1 dB(A) at the highest values in the range. Generally, therefore, this indicates that, at some distance from the road, as flow increases the rate of change in  $L_{A10}$  will be less than for  $L_{Aeq}$ . However, this will be confounded because as flow rate increases the speed of vehicles tend to reduce as the road becomes congested. Alternatively, where traffic flows are high and road speeds are constant, noise levels described on the  $L_{A10}$  scale will attenuate at a greater rate with distance than described using  $L_{Aeq}$ . A further examination of (2.4) also lends support to this effect. As the receiver moves further away from the road the variation in noise level decreases,  $\sigma \rightarrow 0$  and the difference between  $L_{A10}$  and  $L_{Aeq}$  is reduced.

Although it is beyond the scope of this report it is important to note that the influence of noise variation on the relationship between  $L_{A10}$  and  $L_{Aeq}$  is also important when considering screening. Results from studies examining the performance of roadside barriers have shown that barriers reduce noise variability. In general, therefore, barriers may have a larger effect on  $L_{A10}$  than on  $L_{Aeq}$ . Theoretical studies carried out by Fisk (1975) indicate that although this effect is relatively small (i.e. generally less than 1 dB) it is progressive as the screening potential of the barrier increases and is dependent on vehicle speed and traffic flow.

#### 2.2.2 Comparison of indices

The comparison of noise scales detailed in the previous section provides useful insight into the fundamental problem of converting from a statistical scale measure such as  $L_{A10}$  to an integrated average scale measure such as  $L_{Aeq}$ . Such conversions become more complex when considering the conversion of indices where the time intervals also differ. In such cases, the traffic flow parameters are not identical and therefore allowance has to be made to take account of differences in flow

volume, speed and composition of the traffic for the different time periods concerned. In the particular case of interest here, the  $L_{A10,18h}$  index covers the contiguous period from 06:00 to 24:00 hours whereas the  $L_{den}$  is a weighted average of three different periods covering the total day.

A further aspect to be considered when examining the complex relationship between  $L_{A10}$  and  $L_{Aeq}$  is in the derivation of the index,  $L_{A10,18h}$ , which is defined as the arithmetic average of the 18 hourly  $L_{A10,1h}$  values from 06:00 to 24:00 hours. Over the same time period, the  $L_{Aeq,18h}$  index may be derived from a logarithmic average of the 18 hourly  $L_{Aeq,1h}$  values. The difference, therefore, between these two indices will not only depend on the distribution of noise levels within each hour, as discussed above, but also on the diurnal variation of the individual hourly values. For example, if we assume a 3 dB(A) difference between hourly values of  $L_{A10,1h}$  and  $L_{Aeq,1h}$ , as shown in (2.5), the difference between the indices,  $L_{A10,18h}$  and  $L_{Aeq,18h}$ , will also be 3 dB(A) but only if all the hourly values are the same. Generally, as the diurnal variation in hourly values increase the difference between the indices,  $L_{A10,18h}$  and  $L_{Aeq,18h}$ , will be less than 3 dB(A). This is a consequence of the different averaging processes. Any low hourly noise level included in the period will reduce the magnitude of the arithmetically averaged  $L_{A10,18h}$  value relatively more than the logarithmic averaged  $L_{Aeq,18h}$  value. This clearly has important implications for determining conversion factors but also is important in determining equivalent criteria levels used in existing legislation and noise planning policy.

Unfortunately, the available literature comparing noise indices is less comprehensive than that relating to the comparison of noise scales. Brown (1989) has examined the relationship between  $L_{Aeq,24h}$  and  $L_{A10,18h}$  for Australian road conditions. In these cases, the difference in the time periods between the two indices relates to the night period from 24:00 to 06:00 hours where typically the flows are relatively light. Brown notes that for this comparison any low hourly noise level included in the period will reduce the magnitude of the arithmetically averaged  $L_{A10}$  relatively more than they will the energy based  $L_{Aeq}$ . In addition it is noted that the low traffic volumes that occur at night often generate short-term (hourly)  $L_{Aeq}$  values that are greater than short-term  $L_{A10}$  with consequent elevation of the long-term (24 hour)  $L_{Aeq}$ . Brown points out that these two effects are mutually compensating, a fact supported by the average conversion factor listed in his paper that was derived from empirical observations at 19 different sites in Australia,

$$L_{A10,18h} = L_{Aeq,24h} + 3.5 \text{ dB} \quad (\text{Brown, 1989}) \quad (2.10)$$

Brown also used his data set to examine the relationship between the  $L_{den}$  index and  $L_{A10,18h}$ . He noted that, while a simple translation was not applicable, due to the fact that the differences in the scales were themselves dependent on the overall noise level, the data set did provide a regression relationship with a high degree of correlation ( $r^2 = 0.94$ ). Predictive errors involved were of the order of 1.5 to 2 dB (95% confidence limits).

$$L_{den} = 1.21 \times L_{A10,18h} - 14.7 \text{ dB} \quad (\text{Brown, 1989}) \quad (2.11)$$

Huybrechts and Samuels (1998) have also examined the relationships between different road traffic noise indices using measurements taken from relatively high traffic flow locations in Melbourne and the State of Victoria in Australia. The indices compared were  $L_{A10,18h}$  and  $L_{Aeq,24h}$  as well as indices based on a 16-hour day (06:00 to 22:00 hours) and an 8-hour night period (22:00 to 06:00 hours). A regression analysis revealed the following relationships:

$$L_{A10,18h} = L_{Aeq,24h} + 3.2 \text{ dB} \quad (2.12)$$

$$L_{A10,18h} = L_{Aeq,16h} + 2.2 \text{ dB} \quad (2.13)$$

$$L_{A10,18h} = L_{Aeq,8h} + 6.7 \text{ dB} \quad (2.14)$$

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$$L_{A10,16h} = L_{Aeq,16h} + 2.5 \text{ dB} \quad (2.15)$$

$$L_{A10,8h} = L_{Aeq,8h} + 2.6 \text{ dB} \quad (2.16)$$

It should be noted that the relationship between  $L_{A10,18h}$  and  $L_{Aeq,24h}$  is in good agreement with the relationship found by Brown (1989) shown earlier. Huybregts and Samuels also noted the standard deviation of the relationships involving night noise indices was greater than those involving daytime indices. Again this was attributed to the broader range of traffic volumes typically occurring during the night period and to the fact that differences between the  $L_{A10}$  and  $L_{Aeq}$  scales is dependent on traffic parameters, particularly traffic volume. It was concluded that a larger data set was needed in order to reduce the uncertainty introduced through inter-site differences.

### 2.3 DISCUSSION OF THE COMPARISON OF NOISE SCALES AND INDICES

The comparison of noise scales and indices detailed in the previous section provides useful insight into the fundamental problem of converting one to the other. At the simplest level, subtracting 3 dB(A) from  $L_{A10}$  to obtain equivalent  $L_{Aeq}$  scale values appears to be remarkably robust, providing reasonably accurate estimates for a wide range of traffic conditions. However, such simple conversions become more difficult to justify when considering the conversion of indices. Primarily, the fundamental differences between the two forms of index are of importance. The UK index is based on a statistical description of the time varying sound levels whereas the EU indicators are based on a weighted summation of sound energies. This difference is most noticeable when there are large fluctuations in noise levels, typical at sites close to the road where traffic flows are low. Under these conditions, noise indices based on the  $L_{A10}$  scale are influenced by the time distribution of noise events whereas noise indices based on the  $L_{Aeq}$  scale sum the energies of all noise events independently of when they occur.

In addition, the indices refer to different periods of the day. In such cases, the traffic flow parameters are not identical and therefore allowance has to be made to take account of differences in flow volume, speed and composition of the traffic for the different time periods concerned. Furthermore, whereas the index  $L_{A10,10h}$  is based on a simple un-weighted averaging of hourly values, the noise indicator  $L_{den}$  includes a logarithmic averaging of period  $L_{Aeq}$  values with different weighting dependent on the time of day.

Although it may seem that, on the basis of these fundamental differences in formulation, it would be unlikely that a practical relationship between the noise index  $L_{A10,18h}$  with either  $L_{den}$  or  $L_{night}$  exists, the evidence in the literature does not necessarily confirm this. The evidence does suggest, both from empirical and theoretical studies, that a relationship between period  $L_{A10}$  and  $L_{Aeq}$  which is dependent on traffic flow, vehicle speeds and sound propagation can be found. The results from these studies and from further analysis of existing data may therefore provide the foundation for developing an interim prediction method for determining the noise indicators  $L_{den}$  or  $L_{night}$  from predicted  $L_{A10}$  values using CRTN. This prospect is explored further in the following sections.

### 3 METHODS FOR CALCULATING EU NOISE INDICES

The following sections describe the various methodologies that could be introduced to form the basis of an interim prediction method to determine the noise indicators  $L_{den}$  or  $L_{night}$ . It is convenient to separate these methodologies into two different approaches. The first approach, described in section 3.1, deals with methods that enable the noise indicators  $L_{den}$  or  $L_{night}$  to be determined directly assuming the relevant input parameters are known. These methods rely on the development of a  $L_{Aeq}$  traffic noise prediction method and include the French national computation method 'NMPB' (CETUR, 1996) and the model developed by the Noise Advisory Council (Noise Advisory Council, 1978). The second approach, described in section 3.2, deals with methods which enable the noise indicators  $L_{den}$  or  $L_{night}$  to be determined by adapting the procedures described in CRTN. The aim has been to examine the advantages and limitations of each approach to enable a valid, practical and transparent method to be adopted as the basis of an interim prediction method to be used in the UK.

#### 3.1 $L_{Aeq}$ TRAFFIC NOISE MODELS

A fundamental concept common to  $L_{Aeq}$  traffic noise models is to assume that road traffic consists of the movement of a collection of discrete vehicles and that traffic noise is the sum of their individual noise emission. Thus if the acoustic energy of an average single vehicle passby is known then the overall traffic noise level,  $L_{Aeq}$ , can be calculated by the summation of the energy from all the vehicle passbys in the traffic stream.

There are a number of road traffic noise models for predicting  $L_{Aeq}$  available in Europe. The two methods described here have been included for the following reasons. The French 'NMPB' method is recommended in the proposed Directive as a permitted interim prediction method. This recommendation followed a review of European prediction models carried out by TRL for the European Commission (Morgan et al, 2000). The Noise Advisory Council method is an established form of  $L_{Aeq}$  model developed initially in the UK. It is therefore a good example of a form of model that could be simply adapted to produce outputs in terms of the EU recommended indices.

##### 3.1.1 The French 'NMPB' method

This method is based on the decomposition of a line road source into a series of equivalent point sources. For each point source, sound power levels are determined and together with an appropriate propagation model that includes meteorological effects, the contribution from each point source is combined to give the overall level at the receiver position.

The source model includes two categories of vehicles: light which are all vehicles with a gross vehicle weight (gvw) less than 3,500 kg and heavy which are all vehicles with gvw exceeding 3,500 kg. The input sound power levels are expressed in terms of octave bands in the frequency range 125 – 4000 Hz. Values are derived from surveys carried out in France in the 1970's and are therefore typical of French traffic conditions of some thirty years ago (CETUR, 1980). The propagation model allows for two conditions of propagation: "favourable" to propagation e.g. adverse wind conditions; and "homogeneous" where meteorological effects have no influence on propagation. Included in the method are values of the long-term occurrences for meteorological conditions favourable to sound propagation at various locations across France together with contour maps to allow values to be approximated at other locations. The method assumes that when meteorological conditions are not favourable to sound propagation, conditions for homogeneous propagation should be assumed. It follows therefore that since the method does not allow for situations where the wind conditions help to reduce noise propagation, the method will tend to over estimate long-term average values.

Long-term estimates of noise levels are derived by adjusting the source noise levels for propagation assuming both favourable and homogeneous conditions separately to give two noise components,  $L_F$

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and  $L_{A1}$ , respectively. At a given location, if  $p$  is the long-term occurrence of meteorological conditions favourable to sound propagation ( $0 \leq p \leq 1$ ), then the long-term noise level  $L_{A,T}$  is obtained by summing the energy levels  $L_p$  and  $L_{A1}$  weighted with respective occurrences  $p$  and  $(1-p)$  i.e.

$$L_{A,T} = 10 \times \log_{10} \left\{ \left[ p \cdot 10^{L_p/10} + (1-p) \cdot 10^{L_{A1}/10} \right] \right\} \text{ dB(A)} \quad (3.1)$$

Although the method has been recommended by the EU as the interim computation method for predicting road traffic noise there are a number of limitations that would need to be overcome if the method was to be adopted by the UK:

1. The input source data is no longer typical of the vehicle fleet in either France or the UK, or representative of the types of road surfaces currently used in the UK.
2. Input source data typical to UK traffic conditions would need to be developed. The source noise data would need to be expressed in terms of octave-band sound power levels to provide the correct input to the propagation model. Although TRL does have a large data bank of vehicle noise emissions levels including some frequency information, the vehicle data at low speeds or for congested traffic conditions is not suitable for use in predicting absolute traffic noise levels.
3. Existing software programs used for predicting the UK noise indicator,  $L_{A10,18h}$ , could not be adapted to the French 'NMPB' method.
4. Information on meteorological effects which are favourable to noise propagation at all locations in the UK are not, at present, readily available to allow long-term noise indicators to be derived.
5. Results from the prediction method have not been statistically compared with measured values and therefore no standard error in prediction has been published.
6. The method has not been used previously in the UK for routine calculation and therefore there may be some reticence by users in adapting to the new method. Furthermore changing to a completely new method will undoubtedly lead to some inconsistencies and errors initially as users familiarise themselves with the new formulation.

### 3.1.2 The Noise Advisory Council (NAC) method

The NAC method uses a source noise model to predict traffic noise levels,  $L_{Aeq,T}$  at a given reference distance. This provides input to a propagation model based on the UK prediction method CRTN.

The source model requires as input the relationship between noise level and speed for various vehicle categories. From this relationship, together with the mean traffic speed for each vehicle category, the sound exposure level, SEL, typical for each vehicle category is derived<sup>3</sup>. For a two vehicle category model consistent with that used in the CRTN model i.e. light vehicles with unladen weight up to 1525kg and heavy vehicles, the predicted traffic noise level,  $L_{Aeq,T}$  can be determined from the following equation:

$$L_{Aeq,T} = 10 \times \log_{10} \left\{ \left[ p \cdot 10^{SEL_{light}/10} + (100-p) \cdot 10^{SEL_{heavy}/10} \right] \right\} \text{ dB(A)} \quad (3.2)$$

where

<sup>3</sup> The sound exposure level SEL is the level which if maintained constant for a period of 1 second has the same energy as that received during the entire vehicle passby event.

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N is the total vehicle flow in the time period T(s); p is the percentage of heavy vehicles;  $SEL_{light}$  and  $SEL_{heavy}$  are the sound exposure levels typical for light and heavy vehicles in the traffic stream respectively.

Using the appropriate corrections described in CRTN for gradients and road surfaces the noise level,  $L_{Aeq}$  at a reference distance of 10 m from the road is determined. To predict the noise level,  $L_{Aeq}$  at a façade, additional corrections are applied to take account of propagation including distance, ground absorption, screening and reflection effects in accordance with the procedures described in CRTN.

This prediction method has certain advantages over the French 'NMPB' method:

1. The input vehicle noise data does not require octave band sound power levels and therefore is easier to model using existing data.
2. The propagation model follows similar procedures as those described in CRTN and therefore the existing software used for CRTN type calculations may be adapted relatively easily.
3. The method is relatively familiar to UK practitioners and therefore more readily accepted than the French model.

However, if the method were to be introduced as an interim computation method a number of limitations would need to be overcome:

1. Input source data typical to current UK traffic conditions would need to be developed. Although TRL does have a large data bank of vehicle noise emission levels, the data for low speed application or for congested traffic is not suitable for predicting absolute noise levels.
2. The corrections applied to the reference noise level for propagation effects have been derived for the prediction of  $L_{A10}$  and may not be applicable to  $L_{Aeq}$  for all possible conditions encountered in practice. These conditions include the attenuation due to varying ground cover and the screening provided by barriers. However, (Fisk, 1975), reviewed in section 2, has examined the effects on propagation of both types of noise scale and it is anticipated that appropriate corrections could be incorporated based on this reported research.
3. Altering the propagation model may no longer calibrate the method to adverse wind conditions and therefore may introduce complications when adapting the method to predict long-term noise indices.
4. The method would need to provide results which were equivalent with those derived from the French 'NMPB' method.

### 3.2 ADAPTING THE CRTN METHOD

The following sections deal with a range of possible options that will enable the noise indicators  $L_{Aeq}$  or  $L_{night}$  to be determined by adapting the procedures described in CRTN. In the first three options, the approach involves calculating the value of  $L_{A10}$  using the CRTN method in the usual way and then adjusting these values to produce the corresponding values of the relevant EU indicators. It follows that to ensure that these methods are internally consistent, road schemes that require segmenting<sup>4</sup> will require that the 'end correction' is applied to each segment contribution prior to the procedure for combining the noise levels from each segment. The final option, described in section 3.2.4, introduces the possibility of altering the input traffic parameters so that the output from CRTN would directly

<sup>4</sup> Where the generated noise along a length of road varies due to changes in traffic variables, road design or progressive variations in screening, the CRTN procedure is to divide the road scheme into segments within which the noise level varies by less than 2 dB(A). Each segment is then treated as a separate road source.

derive the corresponding EU indicator. The advantages and disadvantages of each approach are described.

### 3.2.1 Modelling the relationship between $L_{A10,1h}$ and $L_{Aeq,1h}$ for different traffic conditions

As previously mentioned in Section 2, there is evidence in the literature both from empirical and theoretical studies of the possibility of establishing a relationship between period  $L_{A10}$  and  $L_{Aeq}$ , for example, (Noise Advisory Council, 1978; Brown, 1989). This suggests that a simple 'end correction' to CRTN calculations of  $L_{A10}$  values would, in principle, be possible. The overall aim would be to provide a model to predict  $L_{A10,1h}$  according to CRTN procedures which can then be converted to  $L_{Aeq,1h}$  values. These values could then be used to calculate the required period  $L_{Aeq}$ 's which can then be used to determine the EU indices.

This approach would have the major advantage of retaining the method that is familiar to UK users and would be easily incorporated into existing software. However, the information contained in the literature needs to be supplemented by additional data and more comprehensive analysis covering a wider range of traffic flow and propagation conditions. In addition, any systematic and random errors introduced by this approach also need to be established before any firm recommendations can be made. The work described in Section 4.1 to 4.4 addresses these issues and the procedures for calculating EU noise indices are described in Section 4.6.

A possible disadvantage of this approach is that hourly traffic information may not be generally available to prospective users.

### 3.2.2 Deriving EU noise indices from the predicted $L_{A10,18h}$ index and the diurnal variation in traffic parameters

A similar approach to that described in Section 3.2.1 would predict the EU noise indices given the predicted noise index  $L_{A10,18h}$  obtained by using CRTN, and information regarding the diurnal variation in traffic parameters. In this form of conversion, the relevant period values of  $L_{Aeq}$  would be derived from the predicted  $L_{A10,18h}$  index by converting to  $L_{Aeq,18h}$  and then corrected according to changes in traffic parameters registered for the relevant time periods. The main advantage of this approach is that users will be able to retain the CRTN model or existing software in their present forms to carry out the initial calculations. The work to support this approach is described in Section 4.5.1 and the procedures for calculating EU noise indices are described in Section 4.6.

Similarly, as with the previous method, this approach relies on the availability of traffic data for the relevant time periods.

### 3.2.3 Using road type to develop relationships between measured UK and EU noise indices

This form of model conversion would enable the user to predict EU noise indices using as input the UK noise index,  $L_{A10,18h}$ , derived using CRTN or appropriate software, and the type of road assuming typical traffic conditions. This approach would provide a potentially viable method where no traffic data is available other than that required by the prediction method CRTN. However, the method would need to be supported by a detailed analysis of existing data relating traffic noise to traffic flow parameters and road classification. The work described in Section 4.5.2 addresses these issues and the procedures for calculating EU noise indices are described in Section 4.6. The objective would be to produce reliable conversion factors,  $L_{A10,18h}$  to  $L_{Aeq}$ , for a range of road classification/descriptors that adequately cover the potential range in the network. As before, the main advantage of this approach is that CRTN is retained as the UK prediction method. However, in addition, detailed information about traffic flows that range outside the normal averaging period required by CRTN would not be required by the user. The main disadvantage is that relatively gross assumptions have to be made about the diurnal variation in traffic flow for different road types. Any significant deviations from the average

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will introduce errors into the eventual conversion calculation. It is uncertain at the present time whether these errors could be confined to an acceptable range for noise mapping purposes.

### 3.2.4 Altering traffic-parameter inputs to derive EU noise indices

In the preceding 3 sections, various methods have been described which may enable the EU indicators to be predicted by applying a correction to the predicted noise level from CRTN, dependent on the range of traffic information available. A possible refinement to this approach would be to alter the input traffic parameters to CRTN such that the predicted noise levels would be equivalent to the EU noise indices. For example, if the correction to derive the EU noise indices  $L_{den}$  and  $L_{night}$  from the predicted UK index  $L_{A10,18h}$  was calculated to be +3 dB(A) and -6 dB(A), respectively, then predicting the absolute  $L_{den}$  value from the CRTN output could be achieved by doubling the input traffic flow and, likewise, for the  $L_{night}$  index, by reducing the traffic flow by a factor of four. The main advantage of this approach is that the user would continue to use CRTN in the normal way and would not be required to make any further adjustments to the output level.

This refinement to the method, however, may lead to confusion. Manipulating the input traffic variables in order to effect a given change in output values could be achieved by any number of different combinations. This could potentially lead to further errors. There are a number of corrections in the procedures described in CRTN which are dependent on the actual traffic parameters e.g. the low flow correction is dependent on traffic flow, the surface correction is dependent on traffic speed. If the actual traffic parameters are not used as input then errors in calculating the noise index  $L_{A10,18h}$  may be introduced if this refinement is included in the method. In addition, where a road scheme requires segmenting due to variations in screening, the value of the correction to convert to  $L_{Aeq}$  indices for each segment may also vary. To allow variations in the correction value would require the input traffic parameters to be altered at the segment boundaries, which may lead to unnecessary confusion.

### 3.3 DISCUSSION OF ALTERNATIVE METHODS OF CALCULATION

The previous sections have illustrated that adopting the French 'NMPB' method as an interim computation method would result in significant problems for users in the UK. Apart from the obvious difficulties for users of introducing a completely new method, and the difficulties imposed by having to write new software programs to accommodate the changes, the main area of concern is the lack of appropriate vehicle noise input data. Users may also be very reticent to adopt a new procedure at this time given that a completely new EU method is promised in a few years time. Changing the official method twice in what will be a relatively short time span is not a particularly attractive proposition for UK practitioners.

The source data contained in the French method was obtained over 30 years ago and clearly relates to the traffic and road surface conditions found to be typical in France at that time. It should also be noted that the French method has never been validated against independently measured traffic noise values and so its accuracy for predicting current UK traffic noise is, at best, questionable. Consequently, if the French method were to be employed in the UK there is a strong case for providing up-to-date vehicle noise emission data to replace the existing French vehicle noise source data. While this is theoretically possible, TRL is not aware of a data-base that is sufficiently comprehensive to allow the necessary source terms to be derived for the whole of the speed range encountered in practice. This is the case for roads where vehicle speeds fall below 80 km/h. As mapping in urban areas (i.e. with traffic moving at low speeds) will form an important part of the exercise, application of this method will be restrictive if the appropriate input data is not available.

The review has also examined the potential advantages and disadvantages of adopting a  $L_{Aeq}$  model such as that described by the Noise Advisory Council. The main difficulty here is that this type of model is neither the officially recommended EU interim procedure nor the standard UK prediction

method. It therefore satisfies neither of the fundamental requirements stipulated by the EU. It also suffers from the same disadvantages for UK users as the French method in that it requires inputted vehicle noise source terms covering a broad range of vehicle operation. It has already been pointed out that this information is scarce particularly at low operating speeds and for congested traffic.

Consequently, the only acceptable and practical alternative to adopting the French model is to adapt in some way the existing CRTN method to enable the noise indicators  $L_{den}$  or  $L_{night}$  to be determined. As has been pointed out the most sensible approach is to attempt to convert period noise indices on the scale  $L_{A10}$  to  $L_{Aeq}$  and then to formulate the EU indices from the converted values. Amending input traffic factors to affect this conversion is a possible approach but is likely to produce confusion by the user and further errors. It is recommended therefore that the best approach is to apply an 'end correction' to the CRTN method using an appropriate conversion model.

The main advantages of this approach are:

1. Programs that follow the procedures described in CRTN will be able to be easily adapted to enable the noise indicators  $L_{den}$  or  $L_{night}$  to be determined.
2. The CRTN philosophy of approach is retained and therefore more acceptable to the UK user than introducing a different method.
3. The method will retain its empirical bias, based on typical UK traffic conditions.

The main disadvantage is that although a range of possible corrections have been produced and published in the scientific literature, a suitably comprehensive and user friendly 'end correction' has not yet been determined for UK conditions. The following section explores this issue further.

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## 4 DERIVING AN 'END CORRECTION' FOR CRTN

CRTN allows the user to calculate values of  $L_{A10,1h}$  or  $L_{A10,15h}$  depending on whether the inputted traffic parameters relate to a single hour or to the specified 18-hour period. The indices  $L_{Aeq}$  or  $L_{A10,1h}$  required by the EU refer to values of  $L_{Aeq}$  averaged over a 12-hour day, 4-hour evening and 8-hour night period - Section 2.1.2 of this report provides details of these relevant time periods.

It is clear, therefore, that in order to convert one form of index into another consideration has to be given to both the basic relationship between the two scales and the different averaging periods involved. Perhaps the simplest way to affect this conversion is to attempt initially to establish a relationship, for a broad range of traffic and site conditions, between predicted values of  $L_{A10,1h}$  using CRTN and corresponding measured values of  $L_{Aeq,1h}$  and then to configure the appropriate EU indices as appropriate from the converted values. Initially it is important to examine the possibility of a relationship between  $L_{A10,1h}$  and  $L_{Aeq,1h}$  for both freely flowing traffic and interrupted or non-freely flowing traffic since the two types of flow may yield different results.

## 4.1 FREELY FLOWING TRAFFIC

To examine the relationship between  $L_{A10,1h}$  and  $L_{Aeq,1h}$  for freely flowing traffic, use was made of a data-base compiled by Sargent and Aspinall (1977). This data-base contains details of 460 measurements taken at 27 different road sites in the UK. This information is documented in terms of a range of traffic noise measures including  $L_{Aeq,1h}$  together with relevant traffic data and site details. It was noted that the traffic was freely flowing at all sites investigated and propagation was not influenced by reflection or screening by barriers or buildings.

The traffic parameters included in the data set covered the following ranges:

Flow:	408 - 4740 vehicles/hour
Composition (%heavies):	2.3 - 57%
Mean traffic speeds:	60 - 102 km/hour
Distance from the kerb:	5 - 260 metres

The traffic parameters and site details described in the report were used as input to a customised spreadsheet containing the CRTN formulation. The spreadsheet produced calculated/predicted values of  $L_{A10,1h}$ . These values were then plotted against the reported measured values of  $L_{Aeq,1h}$  for each of the 460 measurements in the data-base and a regression analysis carried out. These results together with the corresponding regression statistics are shown in Figure 4.1.

It can be seen that although there is some scatter on the data the overall fit provided by the regression line is good over the whole of the range of noise levels encountered. Overall it can be seen that approximately 89% of the measured variance in the  $L_{Aeq,1h}$  levels are explained by the predicted values of  $L_{A10,1h}$  and the standard error of the estimate is relatively low at just over 2 dB(A). It was noted that the low noise level end of the range was achieved mainly from measurements taken at relatively long distances from the road. For these ranges, variations in meteorological conditions can significantly affect the propagation of noise and this could account for the excess scatter seen in the data set at the lower end of the noise level range.

An attempt was made to reduce some of the scatter in the data by regressing the residual variance  $L_{A10,1h} - L_{Aeq,1h}$  against the traffic and site variables. However, perhaps not surprisingly, in view of the high degree of correspondence existing between the basic data from this form of analysis, it did not provide any significant improvement in the degree of correlation obtained.

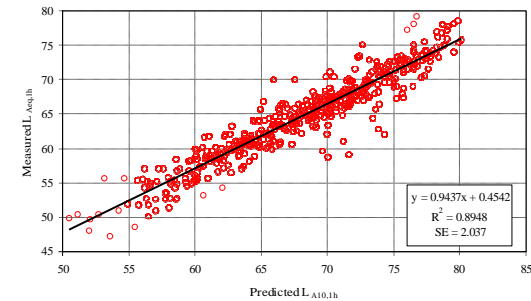


Figure 4.1: Measured  $L_{Aeq,1h}$  and predicted  $L_{A10,1h}$  for free-flow conditions

## 4.2 NON FREELY FLOWING TRAFFIC

Relevant data dealing with non-freely flowing traffic is relatively scarce in the literature. However, in the late seventies, TRL sponsored a study carried out by staff from Imperial College, London to examine both  $L_{A10,1h}$  and  $L_{Aeq,1h}$  in urban streets where the traffic flow was predominantly interrupted (Gilbert, 1977). As part of this study hourly measurements were taken at 17 different sites in the London area. A total of 33 different measurements were identified from this data set that contained sufficient traffic and site layout information for CRTN predictions to be carried out.

The range of traffic parameters included in the data set covered the following ranges:

Total flow:	632 - 1816 vehicles /hour
Percentage commercial vehicles:	3.3 - 27.3 %
Mean traffic speed:	45 km/h <sup>5</sup>
Distance from kerb	4 - 38 metres <sup>6</sup>

It should be noted that the distance range quoted is narrower than that used for freely flowing traffic. This is consistent with the fact that all measurements were carried out in urban streets.

<sup>5</sup> Crompton and Gilbert found that speed in urban areas was not significantly related to overall noise levels. For the purpose of calculating noise using CRTN a default value of 45 km/h has been assumed.

<sup>6</sup> Although the distance from the kerb is an important input value for CRTN predictions, the proximity of buildings on both sides of the road is also important to allow for both single and multiple reflections of traffic noise. However, these reflections would be expected to affect both  $L_{Aeq,1h}$  and  $L_{A10,1h}$  by similar amounts. Consequently comparisons would not be affected. A default value for the effects of reflections has been assumed at all sites.

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The traffic parameters and site details described in the report were used as input to CRTN to obtain calculated/predicted values of  $L_{A10,1h}$ . These values were then plotted against the reported measured values of  $L_{Aeq,1h}$  for each of the 33 measurements in the data-base and a regression analysis carried out. These results together with the corresponding regression statistics are shown in Figure 4.2.

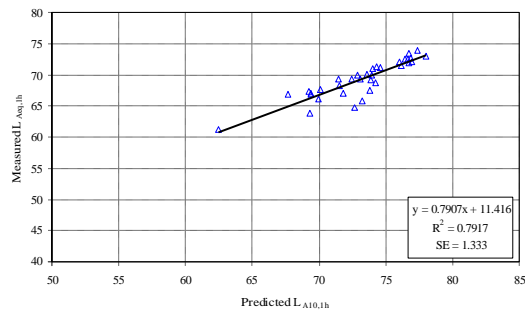


Figure 4.2: Measured  $L_{Aeq,1h}$  and predicted  $L_{A10,1h}$  for interrupted flow conditions

As in the case for freely flowing traffic, shown in Figure 4.1, it can be seen that there is a good fit over the whole of the range of noise levels encountered. Overall it can be seen that approximately 79% of the measured variance in the  $L_{Aeq,1h}$  levels are explained by the predicted values of  $L_{A10,1h}$  and the standard error of the estimate is also low at 1.3 dB(A).

#### 4.3 COMBINING FREE FLOW AND NON FREE FLOW DATA

It is clearly important to compare the relationship found for freely flowing traffic with that found for non-freely flowing traffic. Figure 4.3 shows both data sets combined on the same scales. It is important to note that both data sets produce remarkably similar functional relationships over their respective ranges.

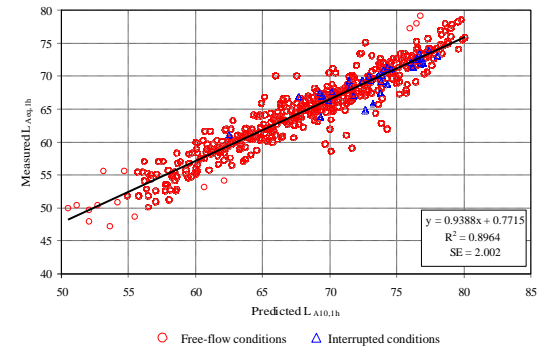


Figure 4.3: Comparing measured  $L_{Aeq,1h}$  and predicted  $L_{A10,1h}$  for interrupted and free-flow conditions

#### 4.4 RELATIONSHIPS BETWEEN MEASURED HOURLY VALUES OF $L_{Aeq}$ AND $L_{A10}$

The previous sections have provided evidence for a functional relationship between predicted values of  $L_{A10,1h}$  obtained using CRTN and corresponding measured values of  $L_{Aeq,1h}$ . Although the form of the relationship appears to be robust in that it appears to be applicable for a broad range of traffic and site layout conditions, a possible criticism is that the measurements used to carry out the analysis were taken in the 70's and are therefore not applicable to current generation traffic. Additionally the measurements were confined to the day time period and so did not cover the night period where often the traffic flows are low. In order to examine these issues relevant data collected by TRL over the period 1991 - 2001 has been collated to form a new data-base. The data has been organised into two separate data files covering the periods 06:00 - 24:00 hours and 24:00 - 06:00 hours.

##### 4.4.1 18-hour period 06:00 - 24:00 hours

The measurements were taken at 76 different sites which provided 1024 measured values of both  $L_{A10,1h}$  and  $L_{Aeq,1h}$ . All measurements were taken in urban areas over the period 06:00 - 24:00 hours and covered a broad range of traffic conditions where traffic was both free flowing and interrupted. All measurements were taken at a height of 4 metres above ground thereby effectively eliminating the effects of varying ground cover at the different sites. However, it should be noted that the ground cover was predominantly acoustically 'hard'.

Figure 4.4 compares the measured values of  $L_{A10,1h}$  and  $L_{Aeq,1h}$  obtained by TRL with the corresponding measured values reported in the 1970's by The Building Research Station and Imperial College. It can be seen that all the data sets compared produce consistent results and there is no

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evidence of any significant differences in the regression relationships determined for the different data sets.

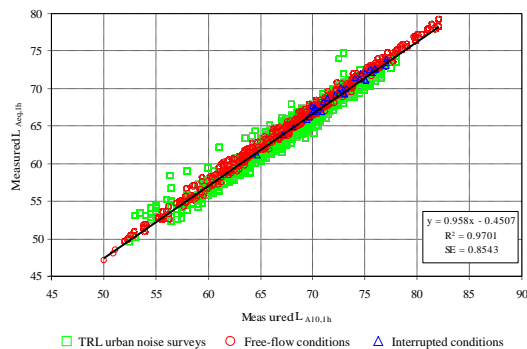


Figure 4.4: Comparing  $L_{Aeq,1h}$  and  $L_{A10,1h}$  for the 18-hour period 06:00 – 24:00

The regression statistics for the combined data set are included on the figure. It can be seen that overall, the measured values of  $L_{A10,1h}$  and  $L_{Aeq,1h}$  are highly correlated with 97% of the observed variance in the values of  $L_{Aeq,1h}$  explained by the measured values of  $L_{A10,1h}$ . Overall the standard error of the estimate is low at 0.85 dB(A).

As a result of this analysis, it is reasonably safe to conclude that the relationship between  $L_{A10,1h}$  and  $L_{Aeq,1h}$  has not changed significantly since the 1970's. It follows, therefore, that the earlier data sets do provide a fair reflection of current relationships between the hourly indices and, at least, for the 18-hour daytime period a close correlation exists between predicted values of  $L_{A10,1h}$  and measured values of  $L_{Aeq,1h}$ . A further point to note is that the regression lines shown on Figure 4.3 and Figure 4.4 are virtually identical indicating that it is reasonable to use measured values of  $L_{A10,1h}$  as a surrogate for predicted values obtained using CRTN.

#### 4.4.2 6-hour period 24:00 - 06:00 hours

During the night period 24:00 - 06:00 hours traffic flows tend to be much lower than during the day. Indeed very low flows are often the norm in residential streets during the early hours. Under these conditions a much higher degree of divergence between measured  $L_{A10,1h}$  and  $L_{Aeq,1h}$  values is to be expected due mainly to the sensitivity of  $L_{Aeq}$  to extraneous noise.

In order to examine the functional relationship between the two indices for the night-time period the data set compiled by TRL was used extracting only data taken during the period 24:00 - 06:00 hours. As in the previous analysis, described in Section 4.4.1, measurements taken at 76 different sites in urban areas were used. This provided 456 different hourly measurements.

The data comparing measured values of  $L_{A10,1h}$  and  $L_{Aeq,1h}$  for the night period are shown in Figure 4.5. The regression line and the correlation statistics are provided on the Figure. Also included is the regression line found for the combined data for the 18-hour daytime period, shown earlier in Figure 4.4. It can be seen that, as expected, a much higher degree of scatter is obtained for the night period.

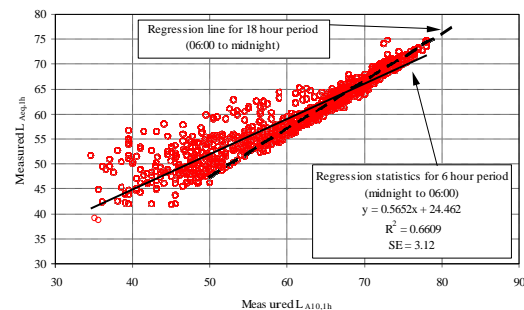


Figure 4.5: Comparing measured  $L_{Aeq,1h}$  and  $L_{A10,1h}$  for the 6-hour period 24:00 – 06:00

This has affected both the observed variance and the standard error values. The variance is lower and the standard error is greater than reported for the daytime period. A further point to note is that the slope of the regression line for the night period is less than for the daytime period. This is primarily caused by the fact that the values of  $L_{Aeq,1h}$  become increasingly unstable as the overall flow reduces. For these conditions  $L_{Aeq}$  values are much more likely to be influenced by extraneous and non-traffic noise sources than are the values of  $L_{A10}$ . Further evidence of this can be seen from the increasing degree of scatter noticeable on the Figure as the overall noise level is reduced.

#### 4.5 RELATIONSHIPS BETWEEN MEASURED $L_{A10,1h}$ AND EU NOISE INDICES

The previous analysis has focussed on comparing both measured and predicted values of  $L_{A10,1h}$  and  $L_{Aeq,1h}$ . This provides the basis of converting CRTN predicted values to EU indices but relies on the user having access to hourly traffic flow data. Clearly where this form of data is not available then it is important to also provide conversion relationships between  $L_{A10,1h}$  and the EU indices directly. There are two possible approaches that could be adopted. Firstly, provided the traffic data is known or can be estimated for the relevant time periods specified by the EU it should be possible to derive values of the EU indices by converting  $L_{A10,1h}$  to  $L_{Aeq,1h}$  and then deriving the appropriate period  $L_{Aeq}$ 's from the traffic data over the relevant time periods. The second approach could be used where only limited traffic data is available and involves converting  $L_{A10,1h}$  directly to the EU indices assuming typical variations in traffic flow etc over the relevant time periods.

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## 4.5.1 Converting to EU noise indices using traffic data

To establish the relationship between  $L_{A10,18h}$  to  $L_{Aeq,18h}$  a comprehensive data-base was compiled from the TRL data set described earlier in Section 4.4 and from data from other surveys taken in mainly residential areas. In addition data obtained from three motorway sites has been added to the database. The motorway data included measurements taken alongside the M4 near Reading, the M25 between junctions 15 and 16, and the M6 near junction 9. The measurements alongside the M4 were taken at one location at a distance of 10 metres from the nearside lane. The measurements at the M25 were taken at two positions located at 10 metres and 210 metres from the edge of the nearside carriageway and measurements on the M6 were taken at a distance of 20 metres. For the measurements taken at the 210m position alongside the M25 the intervening ground cover was pasture. At each location, the measurements were taken continuously over the full 24-hour period generally covering the weekday period (Monday - Thursday). In total the combined data-base contained 203 measurements of both noise indices.

Figure 4.6 shows the results of comparing the measured values of  $L_{A10,18h}$  to  $L_{Aeq,18h}$ . The data differentiates between motorway and non-motorway sites. It can be seen that a very high degree of correlation exists over the whole of the range covered by the data. The correlation statistics indicate that over 99% of the variance is explained and the standard error is small.

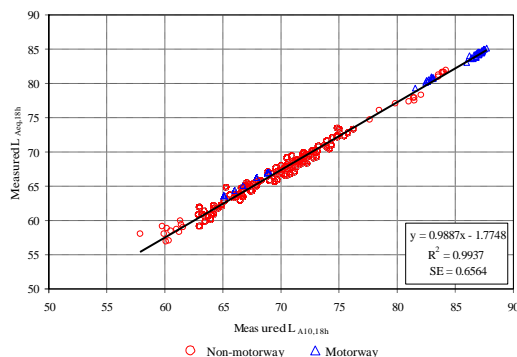


Figure 4.6: Comparison of measured  $L_{A10,18h}$  and  $L_{Aeq,18h}$  noise indices

Having established the functional relationship between  $L_{A10,18h}$  and  $L_{Aeq,18h}$  the following equations were used to determine the period  $L_{Aeq}$ 's specified by the EU in terms of  $L_{A10,18h}$  and the relevant traffic parameters. The functional forms of these equations were determined from the model described by the Noise Advisory Council (Noise Advisory Council, 1978).

$$L_{day} = 0.99 \times_{A10,18h} + 10 \times_{10} \left( \frac{p_h N_t V_t^2}{p_{18} N_{18} V_{18}} \right) \text{ dB} \quad (4.1)$$

$$L_{evening} = 0.99 \times_{A10,18h} + 10 \times_{10} \left( \frac{p_h N_t V_t^2}{p_{18} N_{18} V_{18}} \right) + 4.76 \text{ dB} \quad (4.2)$$

$$L_{night} = 0.99 \times_{A10,18h} + 10 \times_{10} \left( \frac{p_h N_t V_t^2}{p_{18} N_{18} V_{18}} \right) + 1.75 \text{ dB} \quad (4.3)$$

where

$L_{A10,18h}$  dB is the averaged hourly  $L_{A10}$  level measured over the period 06:00 to midnight;

$p_h$  is the percentage of heavy vehicles in the time period  $t$  hours;

$N_t$  is the total traffic flow in the time period  $t$ , and

$V_t$  is the mean traffic speed in the time period  $t$ .

Figure 4.7 compares the predicted values of the  $L_{day}$ ,  $L_{evening}$  and  $L_{night}$  obtained using the equations given above with the corresponding measured values taken from the data set. Also included in the figure are values of  $L_{den}$  determined from the calculated and measured period  $L_{Aeq}$ 's. The line drawn on the figure shows the exact agreement function (i.e. where measured and predicted values are identical).

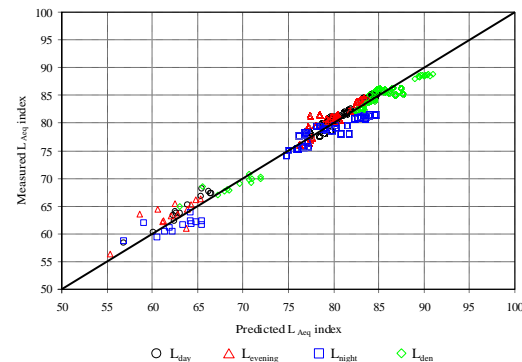


Figure 4.7: Comparison of measured and predicted EU noise indices

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The figure clearly shows that using this approach a high degree of prediction accuracy is achieved over a wide range of noise levels for each of the EU indices and for the composite index  $L_{den}$ . Overall the standard error of the differences between predicted and observed values of  $L_{den}$  was 1.10dB. The corresponding standard errors for the 'day', 'evening' and 'night' indices were 0.67dB, 1.2dB, and 1.56dB respectively.

## 4.5.2 Converting to EU noise indices assuming typical traffic conditions

For situations where traffic data over the relevant time periods is not available then it is potentially possible to determine values of the EU indices from values of  $L_{A10,18h}$  by assuming typical traffic conditions for the type of road being assessed. For this approach it is important to examine these relationships separately for motorways and non-motorway roads. This is because the relationships between day, evening and night time traffic flows are different for these different road types.

## (i) Non-motorway roads

In order to examine relationships for non-motorway roads, the TRL data set described in Section 4.4 was used. Figure 4.8 shows the data and regression relationships obtained when comparing measured values of  $L_{A10,18h}$  with the different  $L_{Aeq}$  indices;  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  and  $L_{den}$ . In all cases a high degree of correlation was obtained although, as expected the correlation with the 8-hour night index was poorer and the standard error larger than for the other indices. Particularly noteworthy is the high degree of correlation between  $L_{den}$  and  $L_{A10,18h}$ .

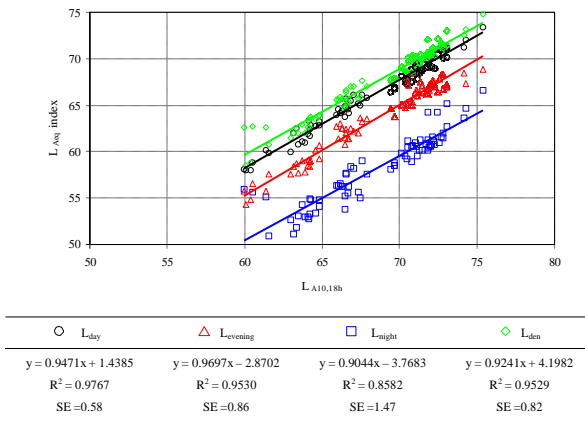


Figure 4.8: Comparing  $L_{Aeq}$  indices and  $L_{A10,18h}$  for non motorway roads

## (ii) Motorways

An analysis for motorway traffic has been accomplished using the data collected by TRL alongside the 3 different motorway sites described earlier in section 4.5.1. In total the number of 24-hour measurements included in the data set was 108.

Figure 4.9 shows the values of  $L_{A10,18h}$  obtained plotted against the various  $L_{Aeq}$  indices of interest. It can be seen that the degree of correlation obtained for each of the indices examined was very good and the standard errors were low in each case. However, it must be noted that the available data is not evenly distributed over the full range of noise levels and this may have flattered the degree of fit indicated by the statistics. The higher levels were recorded at the sites located close to the motorways and the lower levels refer to the site on the M25 located at 210 metres from the motorway. It is important to note that the correlation obtained for the night period was higher than for non-motorway roads with over 92% of the variance explained. This is a reflection of the fact that for motorways the night flows and hence noise levels were generally higher, which provides for a greater degree of stability in the relationship between the two indices.

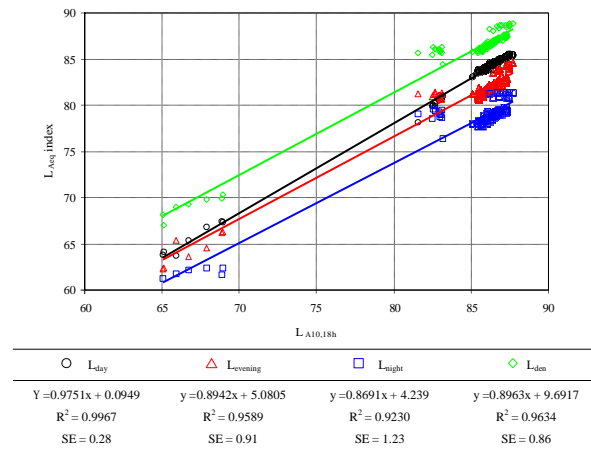


Figure 4.9: The  $L_{A10,18h}$  index and various  $L_{Aeq}$  noise indices for motorways

Despite the gap in the data in the central part of the range of noise levels, the high degree of correlation between  $L_{A10,18h}$  and  $L_{den}$  provides a useful basis for conversion.

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(iii) Comparison of motorway and non-motorway data

It is useful to compare the data presented earlier in Figure 4.8 and Figure 4.9 for non-motorway roads and motorways respectively. Figure 4.10 (a)-(c) show the values of  $L_{A10,18h}$  plotted for both road types on the same scales for the day, evening and night-time periods. The corresponding Figure for the combined index  $L_{Aeq}$  is also shown (d). Interestingly it can be seen that for the daytime period the relations for non-motorway roads and for motorways are essentially identical over their respective ranges. This is to be expected since daytime flow patterns for both road types are generally very similar. Differences between the different relationships are indicated for the evening period and, more noticeably, for the night period. This is evidence of the different flow patterns for the two road types for these periods, particularly during the night. It can also be seen that overall, despite the close agreement for the daytime data, the influence of the evening and night period has also given rise to a different functional relationship for  $L_{Aeq}$  levels for non-motorway roads and motorways.

4.6 PROCEDURE FOR CALCULATING EU NOISE INDICES FROM CRTN DERIVED NOISE LEVELS

The previous sections have described the development of models derived from both measured and predicted data that enable period  $L_{A10}$  noise indices to be converted to period  $L_{Aeq}$  indices. Where possible the procedure for calculating EU noise indices have been based on predicted period  $L_{A10}$  values. However, this has not always been possible due to lack of traffic data, particularly, during the night period on non-motorway roads. In such cases, models derived from measured data have been used. Comparing the regression equations to estimate measured  $L_{Aeq,1h}$  values derived from predicted and measured  $L_{A10,1h}$  values, Figures 4.3 and 4.4 respectively, show that differences in estimated  $L_{Aeq,1h}$  values over the range 50 to 80 dB(A) was no greater than 0.3 dB(A). This indicates that procedures for calculating EU noise indices based on either measured or predicted  $L_{A10}$  values would provide similar results. Generally, the regression analysis has shown that the relationship between  $L_{A10}$  and  $L_{Aeq}$  appear to be remarkably robust for the traffic and site conditions covered by the data. Apart from situations where the flow is anticipated to be low<sup>7</sup> (e.g. non-motorway roads at night) a high degree of correlation was obtained in all cases examined with acceptable errors. The question remains, therefore, as to how to deal with the night period on non-motorway roads where flows can be much lower than during the day.

A possible approach is to use the regression relation derived from the TRL data set for the night period as shown on Figure 4.5. Although the correlation statistics indicate a poorer degree of correlation than for the daytime period, the overall variance explained is still quite good at approximately 66%. Additionally, it is expected that the data will inherently contain a higher degree of scatter at the lower noise levels indicated on the Figure purely as a result of the sensitivity of  $L_{Aeq}$  levels to noise from other sources and from short duration noisy events. The measurements taken were not monitored for extraneous noise.

It is reasonable to assume, therefore, that if it had been possible to remove extraneous noise from the data set, the actual variance explained by the regression analysis would have been higher than that indicated although it is clearly not possible to state by how much. It is clear, however, that the regression line for the night time period, shown in Figure 4.5, will tend to over-estimate values of  $L_{Aeq}$  since removing data points containing extraneous noise will tend to remove those data points that are significantly above the regression line shown on the Figure.

A further point to note is that all measurements included in the analysis were taken at sites that were relatively free from obstructions that could affect propagation. Additionally, the wind conditions at the different sites were either unimportant, due to the close proximity of the measurement points to the road, or, where longer distances were involved, only included data where the wind was blowing with a direction component from the road to the receptor.

<sup>7</sup> Low flows are defined in CRTN as flows less than 200 vehicles per hour.

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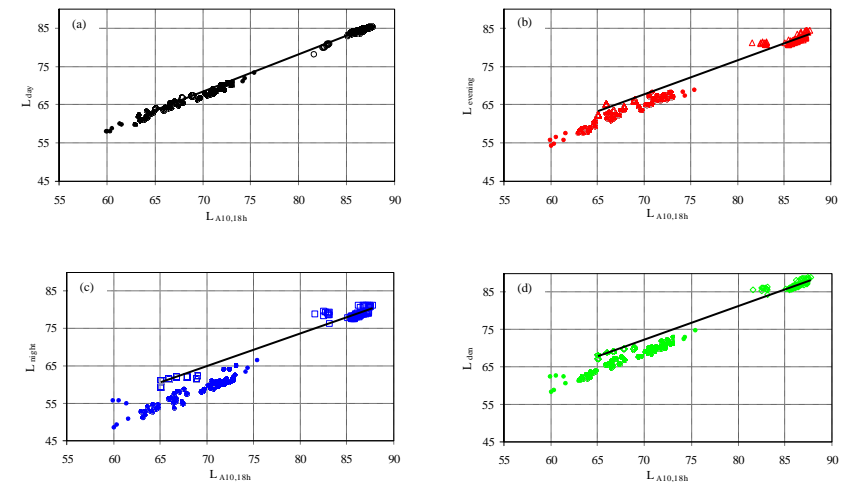


Figure 4.10: The  $L_{A10,18h}$  index and various  $L_{Aeq}$  noise indices for motorways and non-motorway roads

○ △ □ ◇ Motorways      • • • • • Non-motorway roads

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As has been pointed out earlier, the relative effect of screening on the different noise indices is likely to be small in practice. Consequently it appears reasonable, at this interim stage, to accept that the relationships derived for open site conditions can also be applied to sites where screening is involved with acceptable additional errors. The issue regarding wind effects has importance when considering the EU requirement to predict long-term average noise levels. This implies that the EU method has to consider average wind conditions rather than the moderately adverse conditions implicit in the CRTN formulation and in the data used in the analysis described above. This issue may be important when assessing locations with predominantly negative wind vector conditions. For such cases, the application of the conversion relations derived from the analysis described above will then tend to produce values of the EU indices that overestimate the values for average wind conditions.

In view of the above considerations, it is recommended that the following procedure is adopted in the UK as an interim measure to calculate the recommended EU noise indices.

Method 1. When the user has available hourly traffic data then CRTN<sup>8</sup> can be used to produce values of  $L_{A10,1h}$  which can then be converted to  $L_{Aeq,1h}$  values using the relationship from Figure 4.3:-

$$L_{Aeq,1h} = 0.94 > L_{A10,1h} + 0.77 \quad (4.4)$$

dB

However, for non-motorway roads when hourly traffic flows are below 200 vehicles per hour during the period 24:00 to 06:00 hours, the relationship from Figure 4.5 should be used:-

$$L_{Aeq,1h} = 0.57 > L_{A10,1h} + 24.46 \quad (4.5)$$

dB

The converted values obtained for the full 24 hours can then be used to derive the values of  $L_{den}$  and  $L_{night}$  as required by the EU.

Method 2 Where detailed hourly traffic data is not available but traffic data is known or can be estimated for the relevant time periods specified by the EU then CRTN<sup>8</sup> should be used to obtain values of  $L_{A10,18h}$  which should then be converted to  $L_{day}$ ,  $L_{evening}$  and  $L_{night}$  using the following relationships:

$$L_{day} = 0.99 > \frac{+10 >}{A10,18h} \log_{10} \left( \frac{P_2 N_2 V_2^2}{P_{18} N_{18} V_{18}^2} \right) \text{ dB} \quad (4.6)$$

$$L_{evening} = 0.99 > \frac{+10 >}{A10,18h} \log_{10} \left( \frac{P_2 N_2 V_2^2}{P_{18} N_{18} V_{18}^2} \right) + 4.76 \text{ dB} \quad (4.7)$$

$$L_{night} = 0.99 > \frac{+10 >}{A10,18h} \log_{10} \left( \frac{P_2 N_2 V_2^2}{P_{18} N_{18} V_{18}^2} \right) + 1.75 \text{ dB} \quad (4.8)$$

<sup>8</sup> For the purposes of noise mapping, the EU Directive assumes the assessment point is at 2 m in front of the most exposed façade and 4 m above the ground and that reflection effects from the façade are ignored.

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where  $L_{A10,18h}$  dB is the averaged hourly  $L_{A10}$  level measured over the period 06:00 to midnight;  $p_t$  is the percentage of heavy vehicles in the time period  $t$  hours<sup>9</sup>;  $N_t$  is the total traffic flow in the time period  $t$ , and  $V_t$  is the mean traffic speed in the time period  $t$ .

The converted values can then be used to derive the values of  $L_{den}$  using (2.3).

Method 3. Where detailed hourly traffic data is not available then CRTN<sup>10</sup> should be used to obtain values of  $L_{A10,18h}$  which should then be converted to  $L_{day}$ ,  $L_{evening}$  and  $L_{night}$  or, for single segment roads, directly to  $L_{den}$  using the following relationships shown in Figure 4.8 and Figure 4.9.

For non-motorway roads:-

$$L_{day} = 0.95 \times L_{A10,18h} + 1.44 \quad (4.9)$$

$$L_{evening} = 0.97 \times L_{A10,18h} - 2.87 \quad (4.10)$$

$$L_{night} = 0.90 \times L_{A10,18h} - 3.77 \quad (4.11)$$

$$L_{den} = 0.92 \times L_{A10,18h} + 4.20 \quad (4.12)$$

For motorways:-

$$L_{day} = 0.98 \times L_{A10,18h} + 0.09 \quad (4.13)$$

$$L_{evening} = 0.89 \times L_{A10,18h} + 5.08 \quad (4.14)$$

$$L_{night} = 0.87 \times L_{A10,18h} + 4.24 \quad (4.15)$$

$$L_{den} = 0.90 \times L_{A10,18h} + 9.69 \quad (4.16)$$

It should be noted that the preferred method is Method 1. The evidence from both the literature survey and subsequent analysis of data collected for UK traffic conditions indicates that this form of conversion will produce acceptable errors and is robust over a wide range of conditions. Method 2 also provides a good solution where hourly traffic information is not available but where traffic data for the relevant time periods specified by the EU is available. Method 3 is potentially the least reliable of the three methods since it relies on the assumption that different road types will, on average, produce a reasonably consistent diurnal flow pattern. Clearly for roads where significant deviations from the norm occur then further errors in conversion may result.

For each of the methods specified above, where a road scheme consists of several segments it is important initially to determine the components  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  for each segment separately. These values should then be combined to obtain the corresponding values of  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  for the whole road scheme. Once this has been achieved, the value of  $L_{den}$  can be calculated from the combined component values.

Figure 4.11 illustrates the procedure in the form of a flow chart.

<sup>9</sup> When the value of  $p_t$  is zero then put  $p_t = 1$

<sup>10</sup> For the purposes of noise mapping, the EU Directive assumes the assessment point is at 2 m in front of the most exposed façade and 4 m above the ground and that reflection effects from the façade are ignored.

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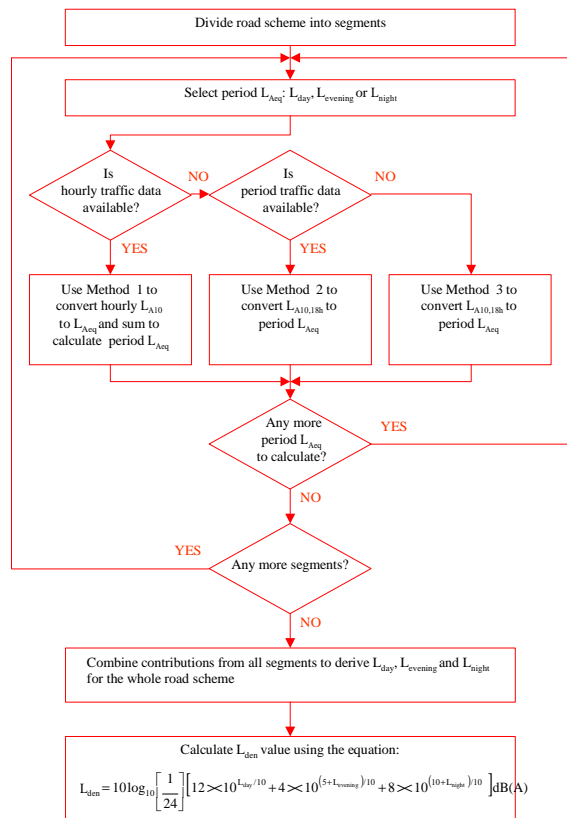


Figure 4.11: Flow chart of prediction method

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## 5 CONCLUSIONS AND RECOMMENDATIONS

This Report provides an examination of the issues and methods that could be employed to develop an interim computation method for use in the UK to carry out noise calculations according to the requirements of the EU Directive. The objective has been to include as wide a range of options as possible for consideration. Two different approaches were considered. The first approach dealt with methods that enable the noise indicators  $L_{den}$  or  $L_{night}$  to be determined directly assuming the relevant input parameters are known. These methods rely on adapting an existing  $L_{Aeq}$  traffic noise prediction method and include the French national computation method 'NMPB' (CETUR, 1996) and the model developed by the Noise Advisory Council (Noise Advisory Council, 1978). The second approach dealt with methods that enable the noise indicators  $L_{den}$  or  $L_{night}$  to be determined by adapting the procedures described in CRTN. The aim has been to examine the advantages and limitation of each approach to enable a valid, practical and transparent method to be adopted as the basis of an interim prediction method in the UK.

The main conclusions are as follows:

1. Adopting either the French 'NMPB' method or the NAC method as an interim computation method poses significant problems. The main limitation is the lack of appropriate vehicle noise input data particularly for roads where vehicle speeds fall below 80 km/h. As mapping in urban areas (i.e. with traffic moving at low speeds) will form an important part of the exercise, application of either method will be restrictive if the appropriate input data is not available.
2. It has been argued that in the interim, the best approach is to adapt CRTN by applying an end correction to obtain the relevant EU indices from calculated values of  $L_{A10}$ .
3. As a result of further analysis carried out on measurement data taken at a wide range of road sites relationships have been established for UK traffic conditions that provide a means of converting CRTN calculated values ( $L_{A10,15}$  or  $L_{A10,18h}$ ) to the relevant EU indices.
4. The preferred approach (Method 1) relies on determining hourly values of  $L_{A10}$  using CRTN and then converting these values to equivalent values of  $L_{Aeq}$ . Values of the EU indices  $L_{den}$  and  $L_{night}$  are then deduced from the 24 hourly  $L_{Aeq}$  values. However, for situations where hourly values cannot be determined, due to the absence of detailed hourly traffic information but where traffic data for the required period indices is known or can be determined, an alternative method is provided (Method 2). This allows CRTN to be used to produce values of  $L_{A10,18h}$  which are then converted to  $L_{Aeq,18h}$  and then subsequently to the component EU noise indices using the relevant period traffic data.  $L_{den}$  is then determined from these component values.
5. Method 3 is the simplest but least reliable of the three methods. It provides a means of determining the EU indices where additional traffic information is not available. The method allows CRTN to be used to produce values of  $L_{A10,18h}$  which are then converted to the EU indices using the conversion formulae provided. However, it relies on the assumption that different road types will, on average, produce a reasonably consistent diurnal flow pattern. For roads where significant deviations in the average conditions occur then errors in conversion may result.
6. The procedures described in this Report provide the basis for an interim computation method that complies with the proposed EU Directive relating to the assessment and management of environmental noise.

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### 6 ACKNOWLEDGEMENTS

The work described in this Report was carried out in the Environment Group of TRL Limited. The authors are grateful to Steve Phillips who carried out the quality review and auditing of this report.

### REFERENCES

- Barry T M and J A Reagan (1978). FHWA highway traffic noise prediction model. Research report FHWA-RD-77-108. Federal Highways Administration, Washington D.C. 20590.
- Brown A L (1989). Some simple transformations for road traffic noise scales. Australian Road Research, Technical Note 1, 19 (4), 309-312.
- Burgess (1978). Relationship between  $L_{10}$  and  $L_{eq}$  for noise from road traffic. Australian Road Research, 8 (3).
- Carter, N L, P Ingham and LK Tran (1992). Overnight traffic noise measurements in bedrooms and outdoors, Pennant Hills Road, Sydney- comparisons with criteria for sleep. Acoustics Australia, 20 (2), 49-55.
- CETUR (1980). Guide du Bruit des Transports Terrestres - prevision des niveaux sonores. Centre d'Etudes Des Transport Urbains, Paris.
- CETUR (1996). Road Traffic Noise. New French calculation method including meteorological effects - experimental version. Centre d'Etudes Des Transport Urbains, Paris.
- Commission of the European Communities (1996). Future noise policy. European Commission Green Paper COM(96) 540, final, Brussels.
- Commission of the European Communities (1999). Position paper on EU noise indicators. Working Group on noise indicators, Commission of the European Communities, Brussels.
- Commission of the European Communities (2000). Proposal for a Directive of the European Parliament and of the Council relating to the Assessment and Management of Environmental Noise. Commission of the European Communities COM(2000) 468 final, Brussels.
- Gilbert (1977). Noise from road traffic (Interrupted flow). Journal of Sound and Vibration, 51 (2), 171-181, London.
- Department of Transport and the Welsh Office (1988). Calculation of Road Traffic Noise. HMSO, London.
- Don and Rees (1985). Road traffic sound level distributions. Journal of Sound and Vibration, 100 (1), 41-53, London.
- Driscoll D A., W J Webster, F G Haag and J W Farinacci (1974). Statistical correlates of the energy-equivalent sound level. Journal of the Acoustical Society of America, 56 (4), 1297-1299.
- Fisk D J (1975). Attenuation of  $L_{10}$  by long barriers. Journal of Sound and Vibration 38 (3), 305-316, London.

Huybregts and Samuels (1998). New relationships between  $L_{10}$  and  $L_{eq}$  for road traffic noise. Proceedings of Internoise 1998. November 16 -18<sup>th</sup>, Christchurch, New Zealand.

Lamure (1975). Noise from road traffic. Chapter 4 of a book 'Road Traffic Noise' by A. Alexandre J Ph Barde, C Lamure and FJ Langdon. Applied Science Publishers Ltd., London.

Lau A H P. and G C K Lam (1989). Inequality relationships for validation of data collected by automatic continuous sound level analysers. Applied Acoustics, 28, 61-66. Elsevier Science Ltd., New York.

Morgan P A and P M Nelson (2000). Selection of interim EU computation methods for road and rail transport noise. Project Report PR/SE/116/00. Transport Research Laboratory.

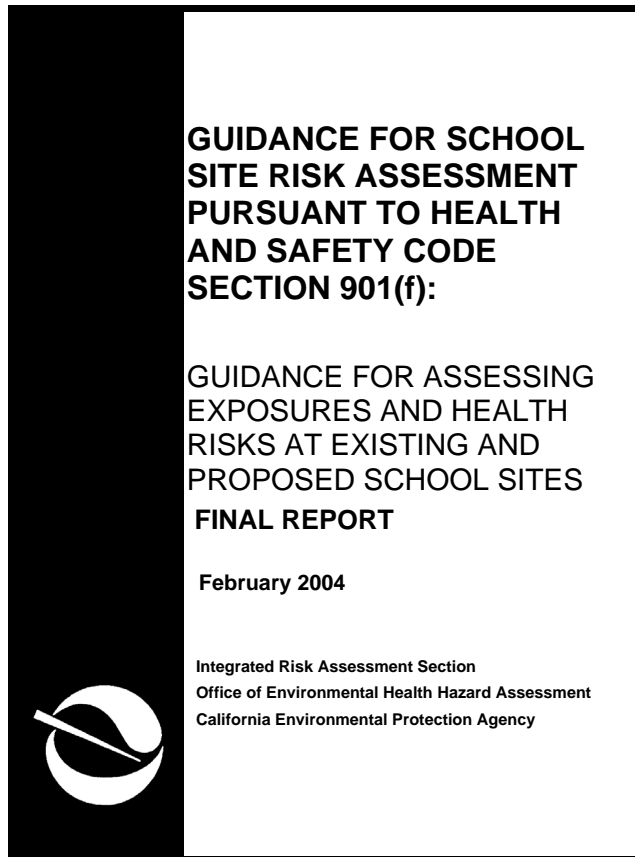
Morton-Williams J B, B Hedges and E Fernando (1978). Road traffic and the environment. Social and Community Planning Research.

The Noise Advisory Council (1978). A guide to measurement and prediction of the equivalent continuous sound level  $L_{eq}$ . HMSO, London.

Reeves G W and Wixley, R A J (1986). Statistical analysis of the relationship between observed values of  $L_{eq}$  and  $L_{10}$ . Safety Engineering National Institute for Transport and Road Research, CSIR, South Africa.

Sargent J W and D T Aspinall (1977). Measurements of noise from roads carrying free-flowing traffic. Note No. N72/77. Building Research Establishment.

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**Guidance for Assessing Exposures and Health Risks  
at Existing and Proposed School Sites Pursuant to  
Health and Safety Code §901(f):**

**FINAL REPORT**

**February 2004**

Integrated Risk Assessment Section  
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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Executive Summary

This guidance document was prepared to comply with California Health and Safety Code Section 901(f), which requires the Office of Environmental Health Hazard Assessment (OEHHA) to develop and publish a guidance document for use by the Department of Toxic Substances Control and other state and local environmental and public health agencies to assess exposures and health risks at existing and proposed school sites. It presents methodology for estimating exposure of school users to toxic chemicals found as contaminants at existing and proposed school sites, and the health risks from those exposures. It incorporates exposure factors unique to the school environment, and considers the activity patterns of children from birth through age 18, and of adult school employees. It discusses uncertainties and steps that can be taken to address these uncertainties.

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#### Introduction and Purpose

Section 901(f) of the California Health and Safety Code states that: "On or before December 31, 2002, the Office (of Environmental Health Hazard Assessment, OEHHA) shall publish a guidance document, for use by the California Department of Toxic Substances Control (DTSC) and other state and local environmental and public health agencies to assess exposures and health risks at existing and proposed school sites. The guidance document shall include, but not be limited to, all of the following:

- (A) Appropriate child-specific routes of exposure unique to the school environment, in addition to those in existing exposure assessment models.
- (B) Appropriate available child-specific numerical health effects guidance values and plans for the development of additional child-specific numerical health effects guidance values.
- (C) The identification of uncertainties in the risk assessment guidance and those actions that should be taken to address those uncertainties."

Pursuant to HSC§901(f)(A) and (C), OEHHA is proposing these guidelines for multimedia, multipathway, risk assessment at existing and proposed school sites. HSC§901(f)(B) is addressed in a separate document (OEHHA, 2002a).

#### Need for Guidance

Children differ from adults anatomically, physiologically, and behaviorally in ways that may affect their exposure or their response to exposure to environmental contaminants. For example, on a body weight basis, children require more oxygen, food, and water, and have a higher skin surface area than adults. Children's activity patterns are different. Children are in a period of continuous change as they move from infancy through puberty and into adulthood. Most previous guidance has focused on residential or occupational scenarios, and has treated childhood as a homogeneous life stage. Recognizing that children are undergoing rapid development, this guidance addresses the differences between children and adults, and between the school setting and other settings.

#### Scope of Guidance

As required by HSC§901(f), this guidance is intended to support assessment of chemical exposures and health risks at existing and proposed school sites, to characterize uncertainty in assessing exposure and risk in the school setting, and to suggest which areas are most in need of further research. It is intended to be sufficiently flexible to accommodate a variety of situations: It may be used to support the evaluation of the suitability of a site for future school construction or to support the assessment of toxicological risk at an existing school site. These contrasting situations present different opportunities to measure contaminant concentrations in environmental media. In the first scenario, soil, soil gas, air, and ground water may be available for sampling, but concentrations in indoor media will have to be estimated. In the second scenario, indoor media such as surface dust and air may be available for sampling. **By sampling these media, additional sources of contaminants, such as chemicals in building materials and furnishings and chemicals used in school operations, can be included in the assessment.**

This guidance specifies toxicity criteria that should be used in assessing risk and hazard. It only addresses risk assessment for schools; it does not address chemical exposures that students and staff may receive outside the school setting. It does not include project-specific guidance such as selection of chemicals of potential concern, site characterization, sampling and analyses strategies, and determination of appropriate exposure point concentrations. This guidance does not provide

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risk management application or decision-making criteria. For information regarding the application of this document to regulatory programs, contact DTSC or other agencies that may utilize this guidance as a part of their regulatory program. This guidance assumes that the user is familiar with the principles of chemical risk assessment; it is not intended to provide basic instruction in risk assessment. **In-progress research is expected to result in information that may render this guidance out-dated. The guidance will be revised as new information becomes available.**

#### Tiered Approach

The model is designed to support a tiered approach to assessment of risk. It can be used in screening (Tier 1) mode, with conservative default input values and all pathways included (except pathways 9, 10, and 12 when these are not appropriate). It also accommodates a Tier 2 analysis using user-supplied site-specific input parameters and/or elimination of pathways that are not appropriate for a given site. In some cases, it may be appropriate to add in additional sources of chemicals in the environment. For example there may be off-site emissions that may impact on-site concentrations.

**Representative measured contaminant concentrations in various environmental media may be used in lieu of modeled values.** Case-specific approaches may be appropriate for these situations in lieu of, or in addition to default methods. Users should document and justify all departures from default conditions so that reviewers can duplicate the modeling conditions and verify the result. Use of this guidance in Tier 1 or Tier 2 mode should be discussed with and approved by DTSC or other regulatory programs for which the risk assessment is being conducted.

#### Mathematical models

Mathematical models can be used to predict exposures and risks to specified groups of people from chemicals in specified environmental media under defined conditions. This guidance lays out a modeling approach to predicting exposures and risks to preschoolers, students, teachers and other school personnel, and their offspring, from chemicals in the soil, shallow ground water, and air at the school site. A separate document, (OEHHA, 2003) presents a spreadsheet adaptation of this model. The use of this spreadsheet (SchoolScreen.xls) is optional, and the user retains the responsibility to ensure that the model parameters including toxicity parameters are current and correct. The model is applicable to most chemicals, the notable exception being lead. OEHHA recommends the use of the DTSC Lead Risk Assessment Spreadsheet (<http://www.dtsc.ca.gov/ScienceTechnology/ledspred.html>) for assessment of exposure to lead at school sites.

#### Schools Conceptual Site Model

A conceptual site model includes the contaminated environmental media, the movement of the chemicals within and between environmental compartments (intermedia transfers), the concentration of the chemical(s) in various personal exposure media, exposure pathways and routes, exposed populations, and the amount of the chemical(s) taken into the body. These movements and concentrations may be described by a series of mathematical relationships. This guidance proposes a series of such mathematical relationships, which are described below.

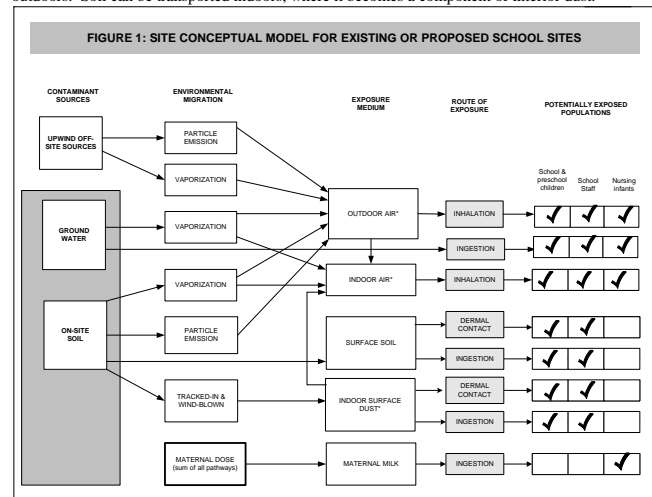
As depicted in Figure 1, this model considers contaminated soil, ground water, and unspecified off-site sources as primary source media. Contaminated soil can be an exposure medium (by ingestion or dermal contact) and can be a source for transfer into other media. Chemicals can vaporize from soil into indoor or outdoor air and can be entrained into the suspended particle phase. As a default,

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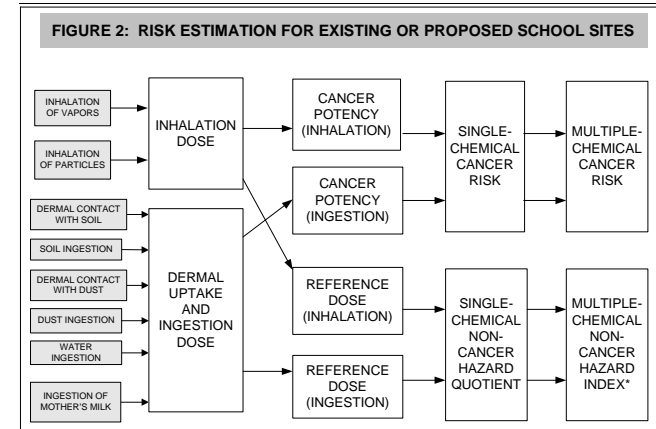
soil is treated as the source of outdoor suspended particulate matter, but a measured concentration in on-site particulate matter may replace the calculated value. By this means, total particle-bound contaminants from off-site and on-site sources can be included. Vapors can be inhaled indoors or outdoors. Soil can be transported indoors, where it becomes a component of interior dust.



\* Available representative measured concentrations in these exposure media may be substituted for the model-based estimates.

Exposure to this dust can be by ingestion or dermal contact, or it can be re-suspended and inhaled. Ground water is treated as a source of drinking water (if pathway 12 is selected) and as a source of chemicals that may vaporize and contribute to soil vapors. However, a measured soil vapor concentration may be substituted for the value estimated from soil and ground water concentrations.

As depicted in Figure 2, hazard quotients and incremental risks are estimated for each chemical; then the hazard quotients and incremental risks associated with the individual chemicals are added to arrive at the total hazard index and total risk. If the total hazard index does not exceed one, then it may be assumed that the non-cancer toxic effects are unlikely and further analysis of non-cancer effects is not necessary. If the total hazard index exceeds one, then it may be useful to separate chemicals by target organ and/or mode of action and add the hazard quotients of only those chemicals that are likely to act in an additive manner. This target organ/mode of action analysis should be documented.



\* Additivity considered as appropriate, depending on target organ and/or mode of action

**Potentially Exposed Sub-populations at Schools**

The model addresses the following school sub-populations. With the exception of pregnant or nursing women, genders are not separated.

- 1) Students from kindergarten through high school
- 2) Staff
- 3) Pregnant or nursing women
- 4) Pre-schoolers aged one through four
- 5) Nursing infants less than one year of age in day care at the school site whose mothers are students or staff. No sources of contaminants other than those associated with the school environment are considered in calculating the concentration in breast milk.

Other groups that may use or visit the school facilities, such as parents and members of the general community are not explicitly considered. Since their visits would be less frequent than the students and staff, their long-term average exposure would be less than that of the groups listed above. Also, it would be possible to assess exposure of nursing infants who did not spend time at the school site, but whose mothers were students or staff. However, these children would be exposed less than infants described above (group #5).

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### Exposure and Source Media at Schools

#### Potential Source Media at Schools

##### Soil

Soil is often the primary environmental medium to be contaminated when toxic materials are spilled or dumped. Soil may be a source medium for contamination of other media such as surface dust or airborne particulate matter or vapors. The model can estimate the concentrations of contaminants in soil gas based on the concentrations in soil matrix and/or ground water, or these concentrations may be measured directly. Soil may be directly contaminated by spills or leaks occurring on the site, or may be contaminated by wet or dry deposition from off-site sources. The model does not explicitly consider deposition; rather it is assumed that this type of contamination will be included in the results of the on-site soil sampling.

##### Ground water

Ground water may be a source of volatile contaminants in indoor and outdoor air. Off-site ground water plumes may need to be considered if they are likely to move on-site.

##### Off-site sources

Atmospheric emission sources within ½ mile of the site that have the potential to contaminate on-site air may be important in estimating overall toxic exposures. Examples could include fixed facilities with known emissions and mobile sources such as highways, heavily traveled streets, or vehicle loading areas. Modeling should evaluate atmospheric concentrations during time frames that reflect conditions to which school users will be exposed.

#### Potential Exposure Media at Schools

##### Soil

Students and others at school sites may be exposed to soil on the campus. Bare dirt may cover a portion of the campus area. Playgrounds and athletic fields may have patches of bare dirt. Even paved areas may contain a layer of soil. Soil may be ingested or may contaminate the skin.

##### Dust

Interior surfaces including floors, desks, shelves, and windowsills, may accumulate a layer of dust between cleanings. This dust may come from multiple sources, including tracked-in or blown-in outdoor soil. Dust may be ingested or may contaminate the skin.

##### Air

Air may contain vapor-phase and/or particulate contaminants. The multiple sources of vapors and particles may include on-site and off-site sources. The model estimates indoor and outdoor concentrations of pollutants in the particulate or vapor phases based on concentrations in on-site soil and/or ground water. Representative measured concentrations of vapor-phase or particulate contaminants in outdoor air may be substituted for estimated values. At existing schools corresponding indoor measurements may also be used. Measurements should be made in an appropriate manner to reflect conditions that school users will be exposed to.

##### Drinking Water

Since ground water may be a source of drinking water (RTI, 2003), the model includes an optional equation for assessing exposure via the drinking water pathway. This equation does not predict concentrations of contaminants in ground water, but relies on measured values.

##### Air contamination by vapor- or particle-phase pollutants originating off-site

Depending on program requirements, modeled on-site concentrations of contaminants originating from off-site sources may be added to estimated concentrations of contaminants from on-site

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sources. Modeling should evaluate atmospheric concentrations during time frames that reflect conditions to which school users will be exposed. If on-site concentrations are measured under representative meteorological conditions (as opposed to modeled), contributions from these off-site contamination sources generally should not be added to the resulting measured concentrations, because the measured concentrations should include the off-site component.

#### Other potential exposure media

In a recent survey, nearly 8 percent of schools reported that produce for human consumption was grown at the site (RTI, 2003). OEHHA considered including food grown in the site soil as an exposure pathway, however, a variety of simulations using an array of chemicals representing various chemical classes (including volatile organic chemicals, lipophilic organic chemicals, and heavy metals) showed that the food pathway never contributed as much as 1 percent of the total risk or hazard, even assuming up to 5 percent of the diet being site-grown produce. Therefore, food is not included as an exposure medium in the schools exposure model.

**Building materials and indoor products may be important sources of indoor exposure to toxic constituents at schools. It may be appropriate to include these sources of chemical exposures in the overall assessment of overall hazards and risks at existing schools. Typically these assessments would be based on measured atmospheric concentrations in classrooms and other indoor areas, and estimated risks, using the same exposure parameters, would be added to site-related risks.** Hazards would be additive among chemicals sharing a common target organ and/or mode of action.

#### Background (non-site-related) Exposures

A small incremental dose of a toxic constituent that would otherwise be of no concern, may become a concern if the exposed person is already receiving a background dose of the constituent and the combined exposures may exceed the toxic threshold. For this reason, risk managers may wish to take background exposures into account in their decision-making process. This is of primary importance for non-carcinogenic toxic effects, which are generally thought to exhibit a toxic threshold. For carcinogens, which are generally treated as exhibiting no threshold, the incremental risk posed by a given exposure to a carcinogen does not depend on the individual's background exposure to that or any other carcinogen.

#### Exposure Pathways

Exposure pathways can be direct or indirect. A direct exposure pathway consists of a contaminated environmental medium and an exposure route by which the contaminated medium contacts and enters the body (e.g. ingestion of contaminated soil, pathway 1, below). An indirect exposure pathway consists of a contaminated environmental medium, one or more transfers between environmental media and ultimately an exposure medium, and an exposure route by which the exposure medium contacts and enters the body (e.g. transfer of chemicals from contaminated soil to indoor dust and ingestion of indoor dust, pathway 3, below).

#### Exposure Pathway Equations

Figure 1 depicts the movements of contaminants into and between environmental and exposure media. These movements and the resulting exposures may be described by a series of mathematical relationships. This model includes up to 12 pathways by which school users could be exposed to chemicals at the school site. Each pathway can be represented by an equation which describes a concentration in the source medium, up to two transfer factors that relate the concentration in the source medium to a concentration in an intermediate or exposure medium, and a contact rate that

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describes the daily intake of, or contact with, the exposure medium. When the exposure pathway is direct (i.e. the environmental medium and the exposure medium are the same, such as ingestion of outdoor soil), then no transfer factors are required. The annual average daily dose associated with each of these pathways is estimated as follows:

1. **Ingestion of outdoor soil:**

$D = C_S * I_S * A_I * F_S * F_O * EF / (BW * 365 \text{ (days/year)})$ , where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>bw</sub>/day)

C<sub>S</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

I<sub>S</sub> = daily soil/dust ingestion (kg<sub>soil</sub>/day)

A<sub>I</sub> = route-specific absorption factor for ingestion (unitless)

F<sub>S</sub> = fraction of daily soil/dust ingestion and dermal contact that occurs at school (unitless)

F<sub>O</sub> = fraction of daily soil/dust ingestion and dermal contact that occurs outdoors (unitless)

BW = age-specific body weight (kg)

EF = exposure frequency (days/year)

2. **Dermal contact with outdoor soil:**

$D = C_S * A_D * F_S * F_O * D_S * EF / 365 \text{ (days/year)}$ , where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>bw</sub>/day)

C<sub>S</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

A<sub>D</sub> = route-specific absorption factor (unitless)

F<sub>S</sub> = fraction of daily soil/dust ingestion and dermal contact that occurs at school (unitless)

F<sub>O</sub> = fraction of daily soil/dust ingestion and dermal contact that occurs outdoors (unitless)

D<sub>S</sub> = Daily dermal contact with soil/dust (kg<sub>soil</sub>/kg<sub>bw</sub>/day) =  $\sum (A_{BP} * L_{BP})$ , where

A<sub>BP</sub> = body-part-specific area (cm<sup>2</sup>/kg)

L<sub>BP</sub> = body-part-specific skin loading (kg<sub>soil</sub>/cm<sup>2</sup>/day)

EF = exposure frequency (days/year)

3. **Migration of chemicals from outdoor soil to indoor dust; ingestion of indoor dust:**

$D = C_S * TF_{SD} * I_S * A_I * F_S * F_I * EF / (BW * 365 \text{ (days/year)})$ , where:

D = Pathway-specific annual average daily dose of contaminant (μg/kg<sub>bw</sub>/day)

C<sub>S</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

TF<sub>SD</sub> = Transfer factor from soil to indoor dust ((mg/kg<sub>dust</sub>)/(mg/kg<sub>soil</sub>))

I<sub>S</sub> = daily soil/dust ingestion (kg<sub>soil</sub>/day)

A<sub>I</sub> = route-specific absorption factor for ingestion (unitless)

F<sub>S</sub> = fraction of daily soil/dust ingestion and dermal contact that occurs at school (unitless)

F<sub>I</sub> = fraction of school soil/dust ingestion that occurs indoors (unitless)

BW = age-specific body weight (kg)

EF = exposure frequency (days/year)

4. **Migration of chemicals from outdoor soil to indoor dust; dermal contact with indoor dust:**

$D = C_S * TF_{SD} * A_D * F_S * F_I * D_S * EF / 365 \text{ (days/year)}$ , where

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>bw</sub>/day)

C<sub>S</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

TF<sub>SD</sub> = Transfer factor from soil to indoor dust ((mg/kg<sub>dust</sub>)/(mg/kg<sub>soil</sub>))

A<sub>D</sub> = route-specific absorption factor (unitless)

F<sub>S</sub> = fraction of daily soil/dust ingestion and dermal contact that occurs at school (unitless)

F<sub>I</sub> = fraction of daily soil/dust dermal contact that occurs indoors (unitless)

D<sub>S</sub> = Daily dermal contact with soil/dust (kg<sub>soil</sub>/kg<sub>bw</sub>/day) =  $\sum (A_{BP} * L_{BP})$ , where

A<sub>BP</sub> = body-part-specific area (cm<sup>2</sup>/kg<sub>bw</sub>)

L<sub>BP</sub> = body-part-specific skin loading (g/cm<sup>2</sup>)

EF = exposure frequency (days/year)

5. **Suspension of soil particles in outdoor air; inhalation of suspended particulate matter (PM10) in outdoor air:**

$D = C_S * TF_{PMS} * PM_{10} * B_O * T_O * A_{In} * EF / 365 \text{ (days/year)}$ , where

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>bw</sub>/day)

C<sub>S</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

PM<sub>10</sub> = Respirable particle load for outdoor air due to resuspension of site soil (kg<sub>PM10</sub>/L<sub>air</sub>)

B<sub>O</sub> = Body-weight-normalized breathing rate outdoors (L/min/kg<sub>bw</sub>)

T<sub>O</sub> = Time outdoors at school daily (min/day)

A<sub>In</sub> = route-specific absorption factor (unitless)

EF = exposure frequency (days/year)

TF<sub>PMS</sub> = Ratio of the concentration of contaminant in outdoor PM<sub>10</sub> originating from site soils to the concentration of contaminant in soil ((mg/kg<sub>PM10</sub>)/(mg/kg<sub>soil</sub>))

A representative measured value for concentration of a chemical in outdoor PM<sub>10</sub> may replace the value estimated from soil data; in that case the equation becomes:

$D = C_{PM10} * PM_{10} * B_O * T_O * A_{In} * EF / 365 \text{ (days/year)}$ , where

C<sub>PM10</sub> = Measured concentration in PM<sub>10</sub> (μg/g)

6. **Suspension of respirable indoor dust particles (PM10) in indoor air; inhalation of PM10 in indoor air:**

$D = C_S * TF_{SD} * TF_{PMD} * S_F * B_I * T_I * A_{In} * EF / 365 \text{ (days/year)}$ , where

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>bw</sub>/day)

C<sub>S</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

S<sub>F</sub> = Respirable particle load for indoor air due to resuspension of dust particles (kg<sub>PM10</sub>/L<sub>air</sub>)

B<sub>I</sub> = Weight-normalized breathing rate indoors (L<sub>air</sub>/min/kg)

T<sub>I</sub> = Time indoors at school daily (min/day)

A<sub>In</sub> = route-specific absorption factor (unitless)

TF<sub>PMD</sub> = Ratio of the concentration of contaminant in indoor PM<sub>10</sub> to the concentration of contaminant in indoor surface dust ((mg/kg<sub>PM10</sub>)/(mg/kg<sub>dust</sub>))

TF<sub>SD</sub> = Transfer factor from soil to indoor dust ((mg/kg<sub>dust</sub>)/(mg/kg<sub>soil</sub>))

EF = exposure frequency (days/year)

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7a. Vaporization of volatile chemicals from the soil; penetration of vapors into building interior; inhalation of vapors mixed with indoor air:

$D = C_s * \alpha * VC_s * CF * B_i * T_i * A_{in} * EF / 365$  (days/year), where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>BW</sub>/day)

C<sub>s</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

α = Ratio of chemical concentration in indoor air to that in soil vapor (unitless)<sup>1</sup>

VC<sub>s</sub> = Volatilization factor from soil (g<sub>soil</sub>/L<sub>vapor</sub>)

CF = Conversion factor (0.001 kg/g)

B<sub>i</sub> = Weight-normalized breathing rate indoors (L/min/kg)

T<sub>i</sub> = Time indoors at school daily (min/day)

A<sub>in</sub> = route-specific absorption factor for inhalation (unitless)

EF = exposure frequency (days/year)

A measured soil vapor concentration may be used in place of the value estimated from soil matrix data.<sup>1</sup> In that case the equation becomes:

$D = C_{sv} * \alpha * B_i * T_i * A_{in}$ , where:

C<sub>sv</sub> = concentration in soil vapor (mg/L) and 7a and 7b collapse into a single pathway 7.

7b. Vaporization of volatile chemicals from shallow ground water; penetration of vapors into building interior; inhalation of vapors mixed with indoor air:

$D = C_{GW} * \alpha * VC_{GW} * CF * B_i * T_i * A_{in} * EF / 365$  (days/year), where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>BW</sub>/day)

C<sub>GW</sub> = Concentration of contaminant in ground water (mg/L)

α = Ratio of chemical concentration in indoor air to that in soil vapor (unitless)<sup>1</sup>

VC<sub>GW</sub> = Volatilization factor from ground water (ml<sub>water</sub>/L<sub>vapor</sub>)

CF = Conversion factor (0.001 L/ml)

B<sub>i</sub> = Weight-normalized breathing rate indoors (L/min/kg)

T<sub>i</sub> = Time indoors at school daily (min/day)

A<sub>in</sub> = route-specific absorption factor for inhalation (unitless)

EF = exposure frequency (days/year)

A measured soil vapor concentration may be used in place of the value estimated from ground water data.<sup>1</sup> In that case the equation becomes:

$D = C_{sv} * \alpha * B_i * T_i * A_{in}$ , where:

C<sub>sv</sub> = concentration in soil vapor (mg/L), and 7a and 7b collapse into a single pathway 7.

8. Inhalation of chemicals vaporized from outdoor soil:

$D = C_s * 1/VF * CF * (B_o * T_o + B_i * T_i) * A_{in} * EF / 365$  (days/year), where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>BW</sub>/day)

C<sub>s</sub> = Concentration of contaminant in soil (mg/kg<sub>soil</sub>)

VF = Volatilization Factor (ratio of concentration in air to concentration in soil) (L<sub>air</sub>/g<sub>soil</sub>)

CF = Conversion factor (0.001 kg/g)

B<sub>o</sub> = Weight-normalized breathing rate outdoors (L/min/kg)

T<sub>o</sub> = Time outdoors at school daily (min/day)

B<sub>i</sub> = Weight-normalized breathing rate indoors (L/min/kg)<sup>2</sup>

T<sub>i</sub> = Time indoors at school daily (min/day)<sup>2</sup>

A<sub>in</sub> = route-specific absorption factor (unitless)

EF = exposure frequency (days/year)

<sup>1</sup> The decision as to which one to use should be made in consultation with the lead agency for the project.

<sup>2</sup> Assumes that HVAC system circulates outdoor air to the indoor spaces.

9. Inhalation of contaminants in vapors that originate off-site<sup>1</sup>:

$D = C_A * (B_i * T_i + B_o * T_o) * A_{in} * EF / 365$  (days/year), where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>BW</sub>/day)

C<sub>A</sub> = Concentration of contaminant vapor in site air (mg/L)

B<sub>i</sub> = Weight-normalized breathing rate indoors (L/min/kg)

T<sub>i</sub> = Time indoors at school daily (min/day)

B<sub>o</sub> = Weight-normalized breathing rate outdoors (L/min/kg)

T<sub>o</sub> = Time outdoors at school daily (min/day)

A<sub>in</sub> = route-specific absorption factor for inhalation (unitless)

EF = exposure frequency (days/year)

This pathway accommodates modeled on-site concentrations from off-site sources. It is independent of (and therefore added to) modeled on-site concentrations. However, representative on-site concentrations measured under conditions that would capture contaminants originating both off-site and on-site, should include the contribution from both sources and therefore would replace modeled concentrations based on on- and off-site sources.

10. Inhalation of contaminants in suspended particles that originate off-site.

$D = C_{AP} * (B_i * T_i + B_o * T_o) * A_{in} * EF / 365$  (days/year), where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>BW</sub>/day)

C<sub>AP</sub> = Concentration of particulate contaminant in site air (mg/L)

B<sub>i</sub> = Weight-normalized breathing rate indoors (L/min/kg)

T<sub>i</sub> = Time indoors at school daily (min/day)

B<sub>o</sub> = Weight-normalized breathing rate outdoors (L/min/kg)

T<sub>o</sub> = Time outdoors at school daily (min/day)

A<sub>in</sub> = route-specific absorption factor for inhalation (unitless)

EF = exposure frequency (days/year)

This pathway accommodates modeled on-site concentrations from off-site sources. It is independent of (and therefore added to) modeled on-site concentrations. However, representative on-site concentrations measured under conditions that would capture contaminants originating both off-site and on-site, should include the contribution from both sources and therefore would replace modeled concentrations based on on- and off-site sources. This pathway may be inappropriate for some programs.

11. Ingestion of contaminants in breast milk (only for infants up to one year old)

$D = C_{BM} * I_{BM} * A_I * EF / 365$  (days/year), where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>BW</sub>/day)

C<sub>BM</sub> = Contaminant concentration in breast milk (mg/kg<sub>milk</sub>), estimated as:

B<sub>BM</sub> \* BW<sub>M</sub> \* maternal annual average daily dose (mg/kg/day) where:

B<sub>BM</sub> = breast milk biotransfer factor ((mg/kg)/(mg/day))

BW<sub>M</sub> = Maternal body weight (kg)

I<sub>BM</sub> = Age-specific, weight normalized daily breast milk ingestion (kg<sub>milk</sub>/kg<sub>BW</sub>/day)

A<sub>I</sub> = route-specific absorption factor for ingestion (unitless)

EF = exposure frequency (days/year)

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## 12. Ingestion of contaminated drinking water:

$D = C_{DW} * I_{DW} * F_S * A_1 * EF / 365$  (days/year); where:

D = Pathway-specific annual average daily dose of contaminant (mg/kg<sub>bw</sub>/day)

C<sub>DW</sub> = User-supplied contaminant concentration in school drinking water (mg/L).

I<sub>DW</sub> = Age-specific, weight normalized daily drinking water ingestion (ml/day/kg)

F<sub>S</sub> = fraction of daily water ingestion that occurs at school (unitless)

A<sub>1</sub> = Ingestion absorption factor (unitless)

EF = exposure frequency (days/year)

\*\* Vapor inhalation pathways may be omitted for chemicals whose boiling point exceeds 600°K

Each of these equations gives a pathway-specific annual average daily dose of the chemical in question. Doses via all pathways that involve the same exposure route (e.g. ingestion) are added together to determine the route-specific annual average daily dose. The latter is divided by the route-specific reference dose (RfD) to arrive at the route-specific hazard quotient (HQ). Dermal exposures are usually combined with ingestion exposures. The route-specific HQs are added to give the chemical-specific HQ. In a screening analysis, the chemical-specific HQs for each chemical are added to give the Hazard Index. In a more detailed (tier 2) analysis, target organs and mechanisms of toxic action may be considered in determining the appropriateness of adding the HQs for individual chemicals.

To compute cancer risk, the route-specific annual average daily dose is converted to a route-specific lifetime average daily dose by multiplying by the fraction of a lifetime represented by each exposure scenario (ED/AT), i.e. 1/70 of a lifetime for each year of exposure. The route-specific lifetime average daily dose is multiplied by the route-specific cancer potency factor to obtain the risk for that pathway. The route-specific risks for relevant pathways are added to give the chemical-specific risk. Finally the chemical-specific risks for each chemical are added to give the total cancer risk. Annual risks may be added for a series of years to obtain the total risk for that period.

**Model Parameters**

The pathway equations above require numerical values or parameters, which can be divided into "intermedia transfer factors" and "exposure factors," which are described below and summarized in a table at the end of each section:

**Intermedia Transfer Factors**

When the environmental medium and the exposure medium are not the same, one or more intermedia transfer factors are involved. Transfer factors describe the relationship between the concentration of a chemical in one compartment and the concentration of the chemical in another compartment, or, in some cases, the concentration of one medium in another, such as the amount of suspended particulate matter in the air. Some indirect pathways – such as vaporization of soil contaminants and movement of the vapors into indoor spaces – involve two or more intermedia transfer factors. Some transfer factors are chemical-specific; others are general. Many of the intermedia transfer factors in this guidance have a default value of one. This begs the question, "Why include them if the value is one?" The reasons for their inclusion are 1) including the parameter facilitates incorporating a site-specific value without altering the equation structure, and 2) further research may support a default value other than one in the future.

**Transfer factor from soil to indoor dust (TF<sub>SD</sub>)**

TF<sub>SD</sub> is the ratio of the concentration of a chemical in the dust on surfaces inside the school building(s) to its concentration in outdoor soil from the schoolyard. This is important because dust

on indoor surfaces may be a significant source of exposure to chemicals originating in soil and transported to the building's interior through open doors and windows, heating, ventilation, and air conditioning (HVAC) systems, building infiltration, and on shoes, clothing, and objects carried into the rooms. OEHHA recommends a default value of 2 for this parameter (see Appendix 1 for further explanation).

**Transfer factor from soil to outdoor particulate matter (TF<sub>PM10</sub>)**

TF<sub>PM10</sub> is the ratio of the concentration of contaminant in outdoor PM<sub>10</sub>, resulting from resuspension of on-site soil, to the concentration of contaminant in outdoor soil from the schoolyard. This is important because students and other school users may inhale suspended respirable particles in the outdoor air. OEHHA recommends a conservative default value of one (1). If samples of outdoor PM<sub>10</sub> are collected and analyzed, this transfer factor is not needed.

**Transfer factor from indoor surface dust to indoor respirable particulate matter (TF<sub>PM10</sub>)**

TF<sub>PM10</sub> is the ratio of the concentration of a chemical in indoor PM<sub>10</sub> to its concentration in indoor surface dust. This is important because students and other school users may inhale suspended respirable particles in the indoor air. OEHHA recommends a default value of one, implying that indoor dust is resuspended in indoor air with no change in its chemical contaminant concentration.

**Soil vapor to Indoor air (α)**

Alpha is the unitless ratio of the concentration of a chemical in indoor air to its concentration in soil vapor. It is a dilution factor for vapors moving from relatively confined spaces in soil pores to the better-ventilated building interior. OEHHA recommends the use of the EPA adaptation of the Johnson and Ettinger (J&E) model to estimate a value for this parameter. OEHHA recommends a default air exchange rate of 4.7 per hour, based on the lower confidence limit on the weighted mean value from 94 portable and 26 traditional classrooms (see Appendix 1 for further discussion). Default values may be used for the remaining parameters including a sandy soil type. Site-specific parameters may be used when justified.

**Volatilization factor from soil (VC<sub>S</sub>)**

VC<sub>S</sub> is the ratio of the concentration of a chemical in soil vapor to its concentration in the soil matrix. This ratio, in g<sub>soil</sub>/L<sub>vapor</sub>, depends on the physical and chemical properties of the chemical, and on the properties of the soil. OEHHA recommends the Johnson and Ettinger screening model (EPA, 2003) to estimate this value.

**Volatilization factor from ground water (VC<sub>GW</sub>)**

VC<sub>GW</sub> is the ratio of the concentration of a chemical in soil vapor to its concentration in shallow ground water. This ratio, in ml<sub>water</sub>/L<sub>vapor</sub>, depends on the physical and chemical properties of the chemical, and on the properties of the soil. OEHHA recommends the Johnson and Ettinger screening model (EPA, 2003) to estimate this value.

**Volatilization factor (VF)**

VF is the ratio of the concentration of a chemical in soil to its concentration in outdoor breathing zone air. To calculate VF, OEHHA recommends the use of the equations in EPA's Soil Screening Guidance (EPA, 1996) with chemical-specific parameters and one modification: to better represent the possible contaminated area on a school site, EPA's default high-end value of Q/C of 68.8 for a 0.5-acre contaminated site is adjusted to 41.24, corresponding to a 10-acre contaminated site.

**Breast milk biotransfer factor (BBM)**

B<sub>BM</sub> (d/kg) of organic chemicals is estimated as 0.0000002 \* K<sub>ow</sub>. The value of 0.0000002 is an empirically determined constant (DTSC, 1994).

**Other Constants**

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**Respirable particle load for outdoor air ( $PM_{10}$ )**

OEHHA recommends a default concentration of  $1.8 \text{ E-}12 \text{ kg}_{PM}/\text{L}$  ( $1.8 \text{ } \mu\text{g}_{PM}/\text{m}^3$ ) for site related  $PM_{10}$  (particulate matter less than 10 microns in diameter) in outdoor air. This value is based on the EPA Soil Screening Levels document (EPA, 1996).

**Respirable particle load for indoor air ( $S_F$ )**

$S_F$  is the concentration in indoor air of particulate material less than 10 microns in diameter ( $PM_{10}$ ) originating from on-site soil. OEHHA recommends a default value of  $1.8 \text{ E-}12 \text{ kg}_{PM}/\text{L}$  ( $1.8 \text{ } \mu\text{g}_{PM}/\text{m}^3$ ). This assumes that indoor PM levels are the same as outdoor PM levels.

**Table 1: Transfer Factors and Other Constants**

Factor	Units	Value	Discussed on Page
$TF_{SD}$	Unitless	2	17
$TF_{PM/S}$	Unitless	1	17
$PM_{10}$	$\text{kg } PM_{10}/\text{L}_{air}$	$1.8 \text{ E-}9$	18
$TF_{PM/D}$	Unitless	1	17
$S_F$	$\text{kg } PM_{10}/\text{L}_{air}$	$1.8 \text{ E-}9$	18
$\alpha$	Unitless	Chemical-specific	17
$VC_S$	$g_{soil}/L_{vapor}$	Chemical-specific	18
$VC_{GW}$	$ml_{water}/L_{vapor}$	Chemical-specific	18
$VF$	$g_{soil}/L_{air}$	Chemical-specific	18
$B_{BM}$	d/kg	Chemical-specific	18

**Exposure Parameters**

Most existing risk assessment guidance is focused on multi-year residential or occupational exposure scenarios. Exposure parameters given in existing guidance are generally long-term averages. This guidance is specifically aimed at school populations, including students, teachers and other staff, and users of on-site day care. Because children are rapidly changing anatomically, physiologically and behaviorally, we recommend a set of exposure parameters for each year until age 18. We believe that it is useful to evaluate the exposure of growing children on a year-by-year basis for several reasons:

- (1) Some chemicals may exhibit age-specific toxicity. OEHHA is currently evaluating this aspect, and plans to publish age-specific toxicity criteria in the near future. Age-specific toxicity criteria should be paired with corresponding age-specific exposure estimates, to the extent possible.
- (2) If the exposure parameters are given on a year-by-year basis, model users can aggregate the years in a manner that best supports the risk management process. Conversely, if OEHHA were to recommend exposure parameters that were averaged over a multi-year period, that averaging period might not match the existing or proposed school scenario. In that case it would be difficult to disaggregate the exposure parameters then re-aggregate them to match the exposure scenario.

The principal sources of exposure factor data for this guidance were the Technical Support Document for Exposure Assessment and Stochastic Analysis (OEHHA, 2000), the Children's Exposure Factors Handbook (EPA, 2002). When more than one value was available for an exposure parameter, preference was given to values that were reported in a way that conformed to the assessment methodology, such as age-specific or short age intervals, and values reported as a

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function of body weight. This avoided or reduced the need to interpolate or extrapolate data and to convert data to appropriate units using uncertain conversion factors. When percentile estimates were available, preference was given to the ninetieth percentile to be consistent with the reasonable maximum exposure (RME; EPA, 1989). Where data were considered equally appropriate for the analysis, preference was given to OEHHA values. Consideration was given to entering the data as distributions rather than as point estimates, but distributions were not available for several critical parameters. This approach will be considered in the future if sufficient data become available.

This guidance includes the following parameters. Recommended parameter values are summarized in Table 8, at the end of this section:

**Soil Ingestion ( $I_S$ )**

$I_S$  is the estimated total daily inadvertent soil and dust ingestion. Geophagia or soil pica is not addressed in this document. EPA (2002, Table 5-19) estimated total daily soil and dust ingestion by children 1-6 years of age as 100 mg/day mean, with 400 mg/day as an upper end, adding that 200 mg/day may be taken as a conservative estimate of the mean. EPA (1997) recommended a value of 50 mg/day for adults. OEHHA (2000, page 4-15) recommends default values of 200 mg/day for children 1 - 6, and 100 mg/day for everyone over the age of 6. The estimated daily soil ingestion rates at school, shown in the last column of Table 2, are based on OEHHA recommendations. Soil ingestion is not normalized to body weight because a) it is not related to any physiologic process that would be a function of weight and b) it is not reported in that way in any of the references cited.

**Table 2: Soil Ingestion**

Age (years)	EPA estimates (mg/day)			Recommended value (mg/day)
	Mean	Conservative mean	Upper end	
<1				0
1-6	100	200	400	200
>6	50			100

**Fraction at school ( $F_S$ )**

$F_S$  is the estimated fraction of total daily soil and dust ingestion and dermal contact that occurs at school on school days. It is calculated as the total time at school (indoors plus outdoors) divided by 16 hours per day. This is based on the assumptions that soil and dust ingestion and dermal contact are proportional to time spent at a given locale, and that soil and dust ingestion occur only during waking hours, which comprise 16 hours per day.

**Body-part-specific skin loading rate ( $L_{BP}$ )**

EPA (2002, chapter 8) recommends the data of Kissel et al. (1996, 1998) and Holmes et al. (1996) as a basis for estimating body-part- and activity-specific soil skin loading ( $L_{BP}$ ,  $\text{kg}/\text{cm}^2/\text{day}$ ). Geometric mean body-part-specific loadings ranged from 0.02 to 0.09  $\text{mg}/\text{cm}^2$  for the day-care kids (see table below). Although this reference does not provide values for the head and trunk, these body parts are likely to be contaminated by soil at rates less than or similar to the legs. Therefore, OEHHA recommends a value of 0.02  $\text{mg}/\text{cm}^2$  for the head and trunk. A "fraction exposed" term is not used, since the studies were based on entire body parts irrespective of whether they were partially clothed or not.

OEHHA considers these data to be the best available because they are based on real-world exposures to young children in day-care centers, (daycare kids #1a, 1b, 2, and 3) an exposure setting similar to that being assessed. The children ranged in age from 1 to 6.5 years and included 17 boys

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and 4 girls (groups 1a and 1b were the same children, measured in the morning and afternoon). They wore long pants (16) or shorts (5), long sleeves (7) or short sleeves (14). Most children wore low socks and shoes, but 5 were barefoot. Exposure times ranged from 3.5 to 8 hours, with no obvious correlation between time and dermal loading. These data are limited by low numbers of children, high inter-individual variability, limited age range and the need to match their activities with those being assessed. The daycare data are preferred for young children because the setting was most similar to the school setting. Data from other groups of children are available: The indoor kids (3 to 13 years of age) and tae-kwon-do participants (8 to 42 years) playing on a carpeted surface for 1.5 to 2 hours generally had lower dermal exposures to soil than the daycare kids. Nine to 14-year-old kids playing in mud for 10 to 20 minutes had much higher dermal exposures (2 – 3 logs). Thirteen to 15-year-olds playing soccer on grass and bare earth for 40 minutes had a soil exposure that was generally similar to the daycare kids.

**Skin Surface area ( $A_{\text{sp}}$ )**

As stated above, EPA (2002) recommends using body-part- and activity-specific soil skin loading rates. In order to do this, skin surface area needs to be calculated on a body-part-specific basis. Data on fractional area of various body parts are found in Table 8-3 (EPA, 2002). Age-specific body surface area data are found in tables 8-1 and 8-2 (EPA, 2002). Table 8-4 (EPA, 2002) supplies surface-area to body weight ratios, but these are pooled for ages 2.1 to 19 years. Since it is apparent from analyzing the data in Tables 8-1, 8-2 and 11-1 (EPA, 2002) that surface-area-to-body-weight ratios change markedly with age, OEHHA recommends using the age-specific data in Tables 8-1, 8-2, and 8-3 to calculate these ratios for children 2 years and older. A sample calculation (for a 1-year-old child) is shown below.

Body part	Fraction of Body <sup>a</sup>		Total skin Area <sup>b</sup> cm <sup>2</sup> /kg	Fractional Area cm <sup>2</sup> /kg	Skin Loading <sup>d</sup> g/cm <sup>2</sup>	Skin Loading <sup>c</sup> g/kg
Head	16.5%	X	641	105.8	0.000020 <sup>f</sup>	0.0021
Trunk	35.5%	X	641	227.6	0.000020 <sup>f</sup>	0.0044
Arms	13.0%	X	641	83.3	0.000023	0.0019
Hands	5.7%	X	641	36.4	0.000092	0.0034
Legs	23.1%	X	641	148.1	0.000020	0.0029
Feet	6.3%	X	641	40.2	0.000065	0.0026
Total	100%			641		0.0173

<sup>a</sup> EPA, 2002, Table 8-3

<sup>b</sup> Estimated from EPA, 2002, Tables 8-4.

<sup>d</sup> EPA, 2002, Table 8-13

<sup>e</sup> Assumes that the school children will be clothed similarly to those in the study (see EPA, 2002, Table 8-12).

<sup>f</sup> There are no data for trunk and head. OEHHA suggests that the value for the legs, i.e. 0.02, be adopted for the head and trunk.

**Fraction outdoors ( $F_o$ )**

$F_o$  is the estimated fraction of the daily school-related dermal and ingested soil/dust exposure that is acquired outdoors. This is calculated as the time spent outdoors divided by the total time spent outdoors and indoors (see below). The implicit assumption is that indoor and outdoor exposure are proportional to time spent in those environments.

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**Fraction indoors ( $F_i$ )**

$F_i$  is the estimated fraction of the daily school-related dermal and ingested soil/dust exposure that is acquired indoors. It is calculated as  $1 - F_o$ .

**Body weight (BW)**

BW for children up to 3 years old is from EPA, 2002, Table 11-1. The 50th percentile values for boys and girls within each year of age were averaged to obtain a representative value. E.g. the body weight for one-year-olds is the average of male and female 50<sup>th</sup> percentile values at 12, 18, and 24 months. Body weights for children older than 3 years are the means for boys and girls at the beginning and end of each age interval from Table 11-2 (EPA, 2002). E.g. the body weight estimate for four-year-olds is the average of male and female means (including clothing) at 4 and 5 years. Mid-range values for body weight are recommended because this parameter appears only in the denominator of the soil ingestion and dermal contact equations, and since the numerators are thought to be conservative estimates of these parameters, it would be excessively conservative to use a low-end body weight. Estimated body weights for various ages are in Tables 3 and 7.

Table 3: Age Related Body Weights

Age (years)	Weight (kg)	Age (years)	Weight (kg)	Age (years)	Weight (kg)
		6-7	23.75	13-14	53.20
0-1	7.04	7-8	26.50	14-15	57.05
1-2	11.08	8-9	29.80	15-16	60.35
2-3	13.29	9-10	33.90	16-17	62.90
3-4	16.35	10-11	38.70	17-18	64.15
4-5	18.55	11-12	43.20	Nursing moms	63.2
5-6	21.15	12-13	47.85		

**Exposure time, outdoors ( $T_o$ )**

Estimates of daily outdoor exposure time ( $T_o$ ), shown in Table 4, are from EPA (2002) Table 9-40. The data are based on national activity pattern survey data, and are weighted according to gender, age, race, employment status, region, season, etc. to represent the U.S. population (Klepeis et al., 2001). OEHHA recommends the 75<sup>th</sup> percentile values (in bold below) because when 75<sup>th</sup> percentile values for time indoors at school and for time outdoors at school are added, the combined time at school ranks at the 95<sup>th</sup> to 99<sup>th</sup> percentile for total time spent at school. Data for infants <1 are not available, so the values for 1-year-olds are recommended as a surrogate.

Table 4: Minutes Spent Outdoors At School Per School Day

Age	50 <sup>th</sup> percentile	75 <sup>th</sup> percentile	95 <sup>th</sup> percentile
1-4	65	140	175
5-11	60	120	220
12-18	55	105	225

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**Exposure time, indoors ( $T_i$ )**

Estimates of daily outdoor exposure time ( $T_o$ ), shown in Table 5, are based on EPA (2002) Table 9-39. OEHHA recommends 75<sup>th</sup> percentile values (in bold below) because when 75<sup>th</sup> percentile values for time indoors at school and for time outdoors at school are added, the combined time at school ranks at the 95<sup>th</sup> to 99<sup>th</sup> percentile for total time spent at school (EPA, 2002, Table 9-34). Data for infants less than 1 year of age are not available, so the values for 1-year-olds are recommended as a surrogate.

Table 5: Minutes Spent Indoors At School Per School Day

Age	50 <sup>th</sup> percentile	75 <sup>th</sup> percentile	95 <sup>th</sup> percentile
1-4	269	<b>500</b>	595
5-11	403	<b>445</b>	565
12-18	420	<b>450</b>	565

**Breathing rate, outdoors ( $B_o$ )**

$B_o$  is the estimated breathing rate for outdoor school activities like walking and running, estimated from the data of Wiley, et al. in OEHHA, 2000, p. 3-27. This Guidance recommends using a value of 0.75 L/min-kg for all ages. This value assumes that 50 percent of outdoor time is spent in moderate activity like outdoor play, outdoor leisure, and golf with a ventilation rate of 0.6 L/min-kg and 50 percent in is spent in heavy activity like walking and active sports with a ventilation rate of 0.9 L/min-kg. Both sets of descriptors in the Wiley, et al. report (moderate activity and heavy activity) were deemed consistent with outdoor activities at school.

**Breathing rate, indoors ( $B_i$ )**

The estimated breathing rate for indoor school activities, were estimated from the data of Wiley, et al. (in OEHHA, 2000, p. 3-25 to 3-26). The light activity category (0.3 L/min-kg) contained activity descriptions compatible with indoor activities at school, such as eating, talking, reading, and homework. The moderate activity category (0.6 L/min-kg) also contained some activity descriptions compatible with indoor school activities for younger children, e.g. indoor play. Therefore we recommend using an average of the ventilation rates for light and moderate activity, i.e. 0.45 L/min-kg, for children up through age 5. For older children the light activity ventilation rate of 0.3 L/min-kg is recommended for indoor activities, since their more vigorous activities typically take place outdoors.

**Exposure frequency (EF)**

The estimated number of days students or other school users attend school annually. Survey data show that the distribution of days of school per year is bimodal, with 94 percent reporting a school year of 161 to 187 days and another 6 percent reporting a school year of 228 to 238 days (RTI, 2003). Based on these results, the recommended default value for a 9-month school year is 180 days, the modal value for a standard 9-month school year. For year-round schooling, a value of 233 days per year, the midpoint of the upper range is recommended.

**Breast milk intake ( $I_{bm}$ )**

This Guidance recommends a daily breast milk ingestion of 130 g/kg/day for the first 12 months of life (OEHHA, 2000, Table 5.13, 90<sup>th</sup> percentile).

**Daily Water Intake ( $I_{bw}$ )**

Daily water intake at school was estimated from EPA, 2000, Table 4-12 and EPA, 1989, Table 3-30. Since OEHHA did not identify any data concerning the proportion of daily water intake that occurs at school, we recommend a value of  $\frac{1}{2}$  the 90<sup>th</sup> percentile daily water intake, based on the proportion of waking hours spent at school on school days (EPA, 2000, Table 9-34). The recommended water intake rates at school in the last column below are  $\frac{1}{2}$  the 90<sup>th</sup> percentile value from EPA, 2000.

Table 6: Water Consumption

Age	EPA Mean	EPA Median	EPA 90 <sup>th</sup> %ile	EPA 95 <sup>th</sup> %ile	Water intake at
<1	46	19	127	156	63.5
1-3	23	17	51	67	25.5
1-10	19	15	42	56	21
11-19	12	9	26	33	13
Pregnant women	18	16	35	40	17.5
Lactating women	21	21	35	37	17.5
Adults	21	19	34		17

**Fraction absorbed, inhalation ( $A_{in}$ )**

The chemical-specific ratio of the total dose of a chemical absorbed through the respiratory tract to the total amount of the chemical inhaled. In the absence of data to support an alternative value, a default value of one should be used.

**Fraction absorbed, ingestion ( $A_i$ )**

The chemical-specific ratio of the total dose of a chemical absorbed through the gastro-intestinal tract to the total amount of the chemical ingested. In the absence of data to support an alternative value, a default value of one should be used.

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**Fraction absorbed, dermal ( $A_D$ )**

The chemical-specific ratio of the total dose of a chemical absorbed through the skin to the total amount of the chemical that is adsorbed onto the skin. Suggested values in Table 7 are from (DTSC, 1994) Table 2, page A-6):

**Table 7: Dermal Absorption Fractions for Compound Classes**

Compound	Absorption	Source
Arsenic	0.04	OEHHA, 2000
Beryllium	0.01	OEHHA, 2000
Cadmium	0.001	OEHHA, 2000
Hexavalent chromium	0.01	OEHHA, 2000
Lead	0.01	OEHHA, 2000
Mercury	0.1	OEHHA, 2000
Nickel	0.04	OEHHA, 2000
Polychlorinated biphenyls	0.14	OEHHA, 2000
Polychlorinated dibenzo-p-dioxins and dibenzofurans	0.02	OEHHA, 2000
Hexachlorocyclohexanes	0.1	OEHHA, 2000
Polynuclear aromatic hydrocarbons,	0.13	OEHHA, 2000
DEHP	0.1	OEHHA, 2000
4,4' methylene dianiline	0.1	OEHHA, 2000
Organophosphates, pentachlorophenol	0.25	DTSC, 1994
Chlorinated insecticides	0.05	DTSC, 1994
Other organic chemicals	0.1	DTSC, 1994
Other metals and complexed cyanides	0.01	DTSC, 1994
Free cyanide	0.1	DTSC, 1994

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**Lifetime Exposure Fraction (ED/AT)**

The fraction of a lifetime represented by each exposure scenario. It enters into the calculation of cancer risk but not the calculation of the hazard index. Exposures need to be adjusted according to the lifetime exposure fraction because while cancer potency factors are based on lifetime exposure, this model estimates school-related exposure and risk for a series of one-year intervals beginning at birth. Since exposures differ from year to year, risks for each year are unique. For single-year scenarios, ED/AT is 1/70 or 0.014. For staff, the exposure duration is 40 years, a standard occupational exposure duration. Annual risks may be added to obtain the aggregate risk for any multi-year period. Risks are treated on an individual risk basis. An alternative would have been to consider population cancer burden. The latter is unaffected by individual exposure duration, as long as the source and the number of exposed people do not change. Treating children's risk on an annual basis has a somewhat similar effect.

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**Table 8: Summary of Recommended Exposure Parameters**

Parameter	Abbreviation	See page	Units	Recommended values for															
				<1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	13-14	15-16	17-18	19-20
Soil Ingestion <sup>a</sup>	I <sub>s</sub>	19	mg/day	0	200	200	200	200	200	100	100	100	100	100	100	100	100	100	100
Fraction at school <sup>b</sup>	F <sub>s</sub>	19	unitless	0.67	0.67	0.67	0.67	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.58	0.58	0.58	0.58	0.58
Fraction outdoors <sup>c</sup>	F <sub>o</sub>	21	unitless	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Body weight <sup>d</sup>	BW	22	Kg	7.04	11.1	13.3	16.4	18.6	21.2	23.8	26.5	29.8	33.9	38.7	42.3	45.9	49.6	53.3	57.0
Surface area, head <sup>e</sup>	SA	20	Cm <sup>2</sup> /kg	117	106	63	55	54	50	47	45	42	38	33	29	25	22	20	20
Loading rate, head <sup>f</sup>	L <sub>ap</sub>	19-20	g/cm <sup>2</sup> /day	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5
Surface area, trunk <sup>g</sup>	A <sub>ap</sub>	20	Cm <sup>2</sup> /kg	229	228	171	128	122	124	126	122	116	107	104	101	97	93	89	85
Loading rate, trunk <sup>h</sup>	L <sub>ap</sub>	19-20	g/cm <sup>2</sup>	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5
Surface area, arms <sup>i</sup>	A <sub>ap</sub>	20	Cm <sup>2</sup> /kg	88	83	53	58	54	50	47	45	42	39	39	39	34	34	35	47
Loading rate, arms <sup>j</sup>	L <sub>ap</sub>	19-20	g/cm <sup>2</sup>	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5
Surface area, hands <sup>k</sup>	A <sub>ap</sub>	20	Cm <sup>2</sup> /kg	34	36	24	24	22	19	17	17	17	16	16	15	14	15	15	14
Loading rate, hands <sup>l</sup>	L <sub>ap</sub>	19-20	g/cm <sup>2</sup>	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5	9e-5
Surface area, legs <sup>m</sup>	A <sub>ap</sub>	20	Cm <sup>2</sup> /kg	132	148	103	108	108	102	98	97	95	90	89	88	87	89	90	82
Loading rate, legs <sup>n</sup>	L <sub>ap</sub>	19-20	g/cm <sup>2</sup>	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5	2e-5
Surface area, feet <sup>o</sup>	A <sub>ap</sub>	20	Cm <sup>2</sup> /kg	42	40	32	29	28	26	25	25	25	24	23	21	20	22	19	19
Loading rate, feet <sup>p</sup>	L <sub>ap</sub>	19-20	g/cm <sup>2</sup>	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5	7e-5
Breathing rate, outdoors <sup>q</sup>	B <sub>o</sub>	23	L/min-kg	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.7
Exposure time, outdoors <sup>r</sup>	T <sub>o</sub>	22	min/day	140	140	140	140	140	120	120	120	120	120	120	105	105	105	105	60
Breathing rate, indoors <sup>s</sup>	B <sub>i</sub>	23	L/min-kg	0.45	0.45	0.45	0.45	0.45	0.45	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Exposure time, indoors <sup>t</sup>	T <sub>i</sub>	23	min/day	500	500	500	500	500	445	445	445	445	445	445	445	450	450	450	480
Exposure frequency <sup>u</sup>	EF	23	days/yr	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Exp. freq. (year-round) <sup>v</sup>	EF	23	days/yr	232	232	232	232	232	232	232	232	232	232	232	232	232	232	232	250
Breast milk intake <sup>w</sup>	I <sub>bm</sub>	23	g/kg/day	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Intake <sup>x</sup>	I <sub>w</sub>		ml/kg/day	63.5	25.5	25.5	25.5	21	21	21	21	21	21	13	13	13	13	13	17.5
Exposure duration <sup>y</sup>	ED	24	Years	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	40
Averaging time <sup>z</sup>	AT	24	Years	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70

<sup>a</sup>The estimated total daily inadvertent soil and dust ingestion, based on OEHHA 2000, page 4-15. Geophagia or soil pica is not addressed in this document.<sup>b</sup>Fraction of daily soil and dust ingestion and dermal loading that occurs at school, based on the number of hours at school daily divided by 16. OEHHA recommends default values of 0.67 for infants < 2 years old, 0.58 for children 2-6 years old, and 0.59 for children 6-18 years old. For older children, values were taken from Table 11-2, the mean for the 50th percentile; mean of boys and girls).<sup>c</sup>Estimated from EPA, 2002, Tables 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>d</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>e</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>f</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>g</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>h</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>i</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>j</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>k</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>l</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>m</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>n</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>o</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>p</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>q</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>r</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>s</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>t</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>u</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>v</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>w</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>x</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>y</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.<sup>z</sup>Based on EPA, 2002, Table 8-1, 8-2, and 8-6. OEHHA suggests not the value for the legs, i.e. 0.02, be adopted for the head and trunk.

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**Risk Assessment****Chemicals of Concern**

Chemicals of concern should be determined in consultation with the lead regulatory agency on the project. Suggested guidance includes DTSC, 1994, section 2.4.6.7.

**Exposure Point Concentration**

Exposure point concentration should be determined in consultation with the lead regulatory agency on the project. Suggested guidance includes DTSC, 1992, Chapter 2.

**Toxicity Criteria**

OEHA cancer potency values and reference exposure levels, which are available at (<http://www.oehha.ca.gov/risk/ChemicalDB/index.asp>) should be preferentially used. Child-specific reference doses (chRD) should be used when available. When OEHA criteria are not available, U.S. EPA criteria found in the Integrated Risk Information System (IRIS) database (<http://www.epa.gov/iriswebp/iris/index.html>) should be used when available. If criteria for a given chemical are not available either from OEHA or in IRIS, criteria from other published sources may be used, subject to approval by the reviewing agency.

**Risk and Hazard Calculation**

Hazard quotients and incremental risks from all exposure routes are estimated and summed for each chemical. The hazard quotients and incremental risks for the individual chemicals are then added to calculate the total hazard index and total risk. For screening assessment, the default assumption is that hazards posed by individual chemicals are additive. Some non-cancer toxic effects of individual chemicals are unlikely to be additive. In those cases, a statement to that effect, with documentation based on target organ and/or mode of action, should be included.

Dose (route a) /RfD (route a) = Hazard Quotient (route a)  
Dose (route b) /RfD (route n) = Hazard Quotient (route n)  
Hazard Quotient (chemical a) =  $\sum$ Hazard Quotient (route a...n)  
Hazard Index =  $\sum$ Hazard Quotient (chemical a...n)\*  
\* For chemicals acting by a similar mode of action or affecting the same target organ  
Dose (route a) \* CPF (route a) = Risk (route a)  
Dose (route b) \* CPF (route n) = Risk (route n)  
Risk (chemical a) =  $\sum$ Risk (route a...n)  
Total Risk =  $\sum$ Risk (chemical a...n)

**Risk Characterization**

Following the methodology described herein will produce age-specific estimates of hazard and risk. At a minimum, the risk characterization should present risk and hazard for each year or group evaluated. In order to calculate the risk for a multi-year period, the risks for individual years must be added. Hazards are not usually considered to be additive from year to year (i.e. the chemical exerts its full effect of within one year). It may be useful to show contributions of individual chemicals and/or individual pathways to total risk and hazard.

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**Sensitivity Analysis**

The calculated risk or hazard may be relatively sensitive or insensitive to changes in various input parameters. Sensitivity analysis is important because it can help direct research or data gathering toward those parameters that will have the most effect on the outcome. For example it would not be highly productive to measure indoor PM<sub>10</sub> levels at a site where the primary contaminant of concern is trichloroethylene. Local sensitivity is the percent change in the total risk or hazard index corresponding to a small change in the value of a specific parameter divided by the percent change in that parameter. It is investigated by changing the input parameter values one at a time and measuring the effect on the risk or hazard. The local sensitivity is dependent on how the parameter is mathematically related to the result. However, it can change, depending on other inputs. For example, the model is very sensitive to changes in soil ingestion rate when soil contamination is the primary problem at a site, but relatively insensitive to changes in soil ingestion rate when ground water contamination is the primary problem at the site. The local sensitivity is also heavily influenced by the properties of the contaminant. For example, risk from volatile chemicals is sensitive to changes in breathing rate and hours spent indoors daily, while risk from non-volatile chemicals is relatively insensitive to changes in these parameters. Because of this variation in sensitivity, we focused on the maximum sensitivity observed under the conditions of our simulations.

For this analysis, representative conditions were selected. The only inputs were 0.15 mg/kg of the chemical in soil and 0.1 µg/L in shallow ground water. The following table shows the results of the analysis for 1-year-olds. The ratio of change in output/change in input has been converted to percentages, i.e. a 1:1 ratio would be shown as 100%. Some parameters (e.g. those that appear in the denominator) change the output in the opposite direction; these are shown as negative percentages. Four chemicals were selected to represent a range of physical and chemical characteristics. They include a volatile chemical, a relatively non-volatile lipophilic organic chemical, a metal and a metal that is carcinogenic by inhalation but not by ingestion. Each chemical was evaluated based on its most sensitive endpoint: For the first three the most sensitive endpoint was carcinogenicity; for the fourth, non-carcinogenic toxicity was limiting.

**Table 9: Local Sensitivity**

Parameter	Local Sensitivity*					Parameter Uncertainty
	Vinyl chloride	DDT	Cadmium	Chromium VI	Maximum	
Indoor dust/outdoor soil	0.10%	74.00%	77.34%	77.29%	77.34%	High
Outdoor PM10/outdoor soil	0.00%	0.00%	0.00%	0.000%	0.000%	High
Outdoor PM10	0.00%	0.00%	0.00%	0.000%	0.000%	High
Indoor PM10	0.00%	0.00%	0.00%	0.000%	0.000%	Moderate
Indoor vapor/Soil vapor (α)	93.90%	3.00%	0.00%	0.000%	93.900%	High
Kow	-0.028%	0.00%	0.00%	0.000%	-0.028%	Moderate
Fraction absorbed, resp	97.30%	4.10%	0.00%	0.000%	97.30%	Moderate
Fraction absorbed, ingest	0.20%	94.90%	99.19%	99.40%	99.40%	Moderate
Fraction absorbed, dermal	2.50%	1.20%	1.05%	0.73%	2.500%	High
Soil vapor/soil matrix (VC <sub>s</sub> )	91.10%	0.00%	0.00%	0.00%	91.10%	High

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Parameter	Local Sensitivity*					Parameter Uncertainty
	Vinyl chloride	DDT	Cadmium	Chromium VI	Maximum	
Soil vapor/groundwater (VC <sub>GW</sub> )	2.90%	3.00%	0.00%	0.00%	3.00%	High
Volatilization Factor (VF)	-5.40%	-1.00%	0.00%	0.00%	-5.40%	High
Soil Ingestion	0.20%	93.20%	98.50%	98.74%	98.74%	High
Fraction at school	0.20%	94.40%	98.50%	98.74%	98.74%	High
Surface area	0.00%	0.80%	0.81%	0.567%	0.81%	Moderate
Fraction outdoors	0.00%	0.50%	0.54%	0.38%	0.54%	Moderate
Body weight	-0.20%	-85.80%	-89.54%	-89.77%	-89.77%	Low
Breathing rate, outdoors	3.40%	1.60%	0.00%	0.00%	3.40%	Moderate
Exposure time, outdoors	3.40%	1.50%	0.41%	0.29%	3.40%	Moderate
Exposure time, indoors	93.90%	2.60%	-0.39%	-0.27%	93.90%	Moderate
Breathing rate, indoors	93.90%	3.00%	0.00%	0.00%	93.90%	Moderate
Exposure frequency	100.00%	100.00%	100.00%	100.00%	100.00%	Moderate
Exposure duration	100.00%	100.00%	100.00%	0.000%	100.00%	High
Averaging time	-90.90%	-90.90%	-90.90%	0.00%	0.00%	Low
Area fraction Head	0.00%	0.30%	0.07%	-0.044%	0.30%	Low
area fraction Trunk	0.00%	0.10%	0.15%	-0.076%	0.15%	Low
area fraction Arms	0.00%	0.00%	0.06%	-0.050%	0.062%	Low
area fraction Hands	0.00%	0.10%	0.11%	0.052%	0.11%	Low
Area fraction Legs	0.00%	0.10%	0.09%	-0.019%	0.10%	Low
area fraction Feet	0.00%	0.10%	0.08%	0.027%	0.10%	Low
Loading Head	0.00%	0.30%	0.07%	0.069%	0.30%	High
loading Trunk	0.00%	0.10%	0.15%	0.15%	0.15%	High
loading Arms	0.00%	0.00%	0.06%	0.062%	0.062%	High
loading Hands	0.00%	0.10%	0.11%	0.109%	0.11%	High
Loading Legs	0.00%	0.10%	0.09%	0.094%	0.10%	High
loading Feet	0.00%	0.10%	0.08%	0.084%	0.10%	High
Reference Dose	0.00%	0.00%	0.00%	100.00%	100.00%	High
Cancer potency	100.00%	100.00%	100.00%	0.00%	100.00%	High

\* Change in risk or hazard divided by change in the input parameter

Parameters that are well characterized (i.e. possessing low uncertainty) are not large contributors to uncertainty in the outcome, regardless of the sensitivity of the outcome to the parameter. Therefore, if either the local sensitivity or the range of uncertainty for any given parameter is small, changes in that parameter are unlikely to have appreciable impact on risk or hazard. In turn, research to reduce the uncertainty in that parameter will be a lower priority because the results will have less effect on the outcome than those with greater local sensitivity or uncertainty.

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For example for a parameter with a local sensitivity of less than 1 percent, a 10-fold error in the parameter value would change the hazard or risk by less than 10 percent. A change of less than 10 percent is not likely to change the result expressed to one significant figure. Risk assessors generally acknowledge that their results are good to only one significant figure at best. Therefore, the analysis of parameter uncertainty below is focused on those with 1 percent or greater local sensitivity and moderate to high uncertainty.

### Uncertainty Analysis

#### Model Uncertainty

In time-dependent models, concentrations, flow rates, and dose rates change with time. Time-independent models like the one described herein assume that conditions are at equilibrium and do not change over time. They do not account for source depletion. This could result in overestimating risk, particularly if multi-year exposures are considered.

This model does not consider all possible transport mechanisms or all possible factors affecting environmental fate and transport of environmental contaminants. For example, it does not consider transport of soil contaminants to ground water, transfer from soil or air into edible plants, or redeposition of particulate matter. However, the authors believe it considers the principal determinants of chemical exposures at schools.

#### Exposure Pathway Uncertainty

This model does not consider all possible exposure pathways. For example, crops could be grown in site soil and contaminated ground water could be used to irrigate site-grown crops, thereby transferring contaminants to produce eaten by students and staff. Inhalation of volatile chemicals while showering is not included. The contribution of these pathways to the overall risk or hazard is minimal.

#### Parameter Uncertainty

In addition to a unique exposure scenario, exposure assessment for schools requires a unique set of exposure parameters. For example, building parameters, and age distribution and activity patterns of the school users differ from typical residential, recreational, and occupational settings. As discussed above, under the heading "Sensitivity Analysis," parameters with a local sensitivity of 1 percent or greater and those that have a high level of uncertainty are the primary focus of this discussion.

#### Transfer factor from soil to indoor dust (TF<sub>SD</sub>)

Interior dust is an important exposure medium in school site exposure assessment because students typically spend much of their time at school in classrooms and other indoor areas. The fraction of dust that comes from site soil is poorly characterized, but significant, inasmuch as other sources of interior dust are less affected by site selection. This parameter was considered a good candidate for further study because it has high local sensitivity (77 percent) and there are no published values for this parameter in the school setting. The recommended default dust/soil transfer factor (2) is based on relative concentrations of several elements in outdoor soil and interior dust at California schools (RTI, 2003b, see Appendix 1).

#### Soil vapor to indoor air (α)

The ratio of chemical concentration in indoor air to that in soil vapor parameter (alpha) is a good candidate for further study because it has a high local sensitivity for some chemicals (up to 94 percent) and because there are limited data for ventilation rates at schools. Site-specific factors such as operation of the HVAC system (positive or negative pressure, ventilation rates, etc.),

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type of foundation, and use of doors and windows will substantially affect alpha. The recommended default ventilation rate for use in the Johnson and Ettinger model (4.7 changes/hr) is based on ventilation rate data from California schools (RTI, 2003a, see Appendix 1).

**Volatilization factor from soil ( $VC_s$ )**

The ratio of the contaminant concentration in soil vapor to that in soil matrix depends on the physical and chemical properties of the chemical, as well as soil properties. This ratio, in  $\mu\text{g}/L_{\text{vapor}}/(\mu\text{g}/g_{\text{soil}})$  (or  $g_{\text{soil}}/L_{\text{vapor}}$ ), has a high local sensitivity (up to 91 percent for volatile chemicals) and is relatively uncertain. However, the uncertainty can be partially offset by sampling soil vapors in addition to soil matrix. Since there is no reason to believe that  $VC_s$  would be different in a school environment than in other environments, OEHHHA recommends the Johnson and Ettinger model (EPA, 2000 (2)) to estimate this value.

**Volatilization factor from ground water ( $VC_{gw}$ )**

The ratio of the contaminant concentration in soil vapor to that in shallow groundwater depends on the physical and chemical properties of the chemical, as well as soil properties. This ratio, in  $\mu\text{g}/L_{\text{vapor}}/(\mu\text{g}/\text{ml}_{\text{water}})$  (or  $\text{ml}_{\text{water}}/L_{\text{vapor}}$ ), has a moderate local sensitivity (up to 3 percent for volatile chemicals) and is relatively uncertain. However, the uncertainty can be partially offset by sampling soil vapors in addition to ground water. Since there is no reason to believe that this factor would be different in a school environment than in other environments, OEHHHA recommends the Johnson and Ettinger model (EPA, 2000 (2)) to estimate this value.

**Volatilization factor (VF)**

The volatilization factor has a moderate local sensitivity – up to 5.4 percent. It is based on a well-reviewed document. However, OEHHHA recommends adjusting the contaminated area to 10 acres (compared to the default value of 0.5 acres) to more closely reflect the size of a school site. This reduces VF by approximately 40 percent, which increases the atmospheric concentration by about 67 percent, since atmospheric concentration is a function of  $1/VF$ .

**Soil Ingestion ( $I_s$ )**

Soil and dust ingestion is a good candidate for further study because it has a high local sensitivity (up to 99 percent) and high parameter uncertainty. U.S. EPA has estimated soil/dust ingestion by children and adults, and these values are widely applied in the residential setting. There are no estimates specific to the school environment; however, some of the data, collected in day care facilities, may be relevant to a school environment. Research in the area of soil and dust ingestion in schools could reduce uncertainty in this parameter. Since the recommended value is equivalent to U.S. EPA's conservative estimate of central tendency, the model is unlikely to underestimate soil ingestion for most children and adults. However a few children at the upper end of the distribution may ingest more soil than the 200 mg/day default.

**Fraction at School (FS)**

The fraction of the daily soil ingestion and dermal contact that occurs at school on school days is another parameter with a high local sensitivity (up to 99 percent). The recommended values are based on the estimated fraction of the waking hours that are spent at school, and the assumption that these exposure pathways are proportional to time spent in an environment (i.e., that soil ingestion and dermal contact do not occur preferentially at school or at home). The uncertainty is in both directions, but the maximum underestimate is less than two-fold, since the recommended values range from 58 to 67 percent and the true value could not exceed 100 percent.

**Body Weight (BW)**

Body weight has a high local sensitivity (up to -90 percent) for chemicals whose exposure is primarily by soil ingestion. This is because soil ingestion is not normalized to body weight in this model. The negative sign indicates that risk decreases as body weight increases. However, body weight is not particularly uncertain.

**Breathing Rate, Outdoors and Indoors ( $B_o, B_i$ )**

Outdoor breathing rate has a moderate local sensitivity (up to 3.4 percent for volatile chemicals). Indoor breathing rate has a high local sensitivity (up to 94 percent for volatile chemicals). The recommended breathing rates are based on studies involving 52 children ranging in age from 3 to 12 years and another 160 children and adults from age 6 to 77 (OEHHHA, 2000, p. 3-8 to 3-13). Since activity-specific breathing rates are not available for children in a school environment, we assigned average breathing rates for indoor and outdoor activities based on breathing rates for similar activities that were reported in those studies. Detailed observations of pre-school and school children of various ages could help to reduce the uncertainty in these parameters. However, even with more data, variation between schools and between individuals is likely to be considerable, and inferences would still have to be made concerning which measured respiration rates correspond to the observed activities.

**Exposure Time, Outdoors and Indoors ( $T_o, T_i$ )**

The outdoor exposure time has a moderate local sensitivity (up to 3.4 percent for volatile chemicals). Indoor exposure time has a high local sensitivity (up to 94 percent for volatile chemicals). Data from EPA, 2002, Table 9-40 (used to estimate time spent outdoors on school grounds) may overestimate actual time spent outdoors on school grounds since they include time spent at playgrounds as well as at school grounds. The sum of the recommended 75th percentile exposure times indoors and outdoors is 555 to 620 minutes per day. California law requires a minimum of 50,400 minutes of instructional time per year for grades 1-8. Based on a typical 180-day schedule, this translates to 280 minutes per day. Even allowing another 90 minutes for lunch, recesses, and/or between-class time brings the total to 370 minutes, considerably less than the recommended 75th percentile estimates. Part of the difference could be explained by other time spent at school such as participation in before- or after-school activities. Surveys focused specifically on the school environment could help to narrow this range of uncertainty.

**Exposure Frequency (EF)**

Exposure frequency has a high local sensitivity (100 percent) because this value enters into every calculation of risk and hazard. While it is not particularly uncertain, it is quite variable, ranging from the minimum days per year required by law to a maximum for a student, staff member, or day-care child who attends the school year-round. Table 10 shows the reported number of planned school days for the current school year for the 54 California schools that interpreted the question correctly (RTI, 2003). The bimodal distribution suggests that a single value may not adequately represent the data.

**Table 10: Frequency Distribution of Annual School Days**

Number of Days	Number of Schools	Percent
Less than 180 days	9	16.7
180 days	34	63.0
181 to 187	8	14.8
188 to 227	0	0
228 to 238	3	5.6

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**Lifetime Exposure Fraction (ED/AT)**

Lifetime exposure fraction is the fraction of a lifetime represented by each exposure scenario. It has a local sensitivity of 100 percent for carcinogenicity but does not enter into the calculation of the hazard index. For single-year scenarios, ED/AT is 1/70 or 0.014. Averaging time (in effect, the expected life span) has a relatively low uncertainty and is a widely applied value. Exposures need to be adjusted according to the lifetime exposure fraction because while cancer potency factors are based on lifetime exposure, this model estimates school-related exposure and risk for a series of one-year intervals beginning at birth. This involves interpolation and therefore introduces uncertainty. Since exposures differ from year to year, risks for each year are unique. Because the risks are calculated on a year-by-year basis, annual risks may be added to obtain the aggregate risk for any multi-year period.

**Reference Dose (RfD)**

Reference dose has a high local sensitivity (100 percent for non-carcinogenic effects). The uncertainty varies from minimal (when the RfD is based on data from sensitive humans) to considerable (when multiple uncertainty factors are involved such as when the RfD is based on laboratory animals and/or inadequate studies). The need for reference doses reflecting the potentially greater sensitivity of children to toxic effects of some chemicals is under evaluation by OEHHA.

**Cancer Potency**

Cancer potency has a high local sensitivity (100 percent for carcinogenic effects). The uncertainty varies from moderate (when the potency is based on human cancer incidence data) to high (when extrapolated from high-dose rodent data). There is additional uncertainty in extrapolating carcinogenic potency determined in a full lifetime study to less-than-lifetime exposure scenarios. The typical approach is to assume linearity, i.e. half the exposure is equivalent to half the risk. However, there is evidence that less-than-lifetime exposure of some carcinogens to children and infants may be more potent in inducing cancer than the same exposure later in life. Because exposures at school sites are changing from year to year, and because they may be for shorter time periods than residential or occupational exposures, OEHHA deems it beneficial to assess risks on a year-by-year basis. Year-by-year exposure estimates have the potential to be used in conjunction with future age-specific potency estimates. Methodology to evaluate carcinogenic potency of early-in-life exposures is the subject of ongoing OEHHA and U.S. EPA projects. EPA's draft policy for evaluating carcinogenic potency of early-in-life exposures has been reviewed by the Science Advisory Board, and EPA is responding to the Board's comments and public comments.

**Fraction Absorbed, Resp (AI<sub>n</sub>), Fraction Absorbed, Ingest (AI)**

The fraction absorbed by the respiratory and ingestion routes has a high local sensitivity (up to 99 percent). The recommended default value of one implies that absorption is the same in the exposure situation as in the study(s) that are the basis for the toxicity criteria, an assumption widely accepted in the risk assessment community. In reality, the rats may have been fed or dosed with the test chemical mixed into a vehicle that enhances absorption compared to the form to which humans will be exposed. Conversely, the rats may have been exposed to a poorly absorbed form while humans are exposed to a readily absorbed form, though this seems less likely. Route-specific absorption is an important issue for inter-route extrapolation. The uncertainty is in both directions but is not likely to exceed a two- or three-fold error, since most

compounds are readily absorbed the gastro-intestinal or the respiratory mucosa. OEHHA has no current plans for research on these parameters.

**Fraction Absorbed, Dermal (AD)**

Although the fraction absorbed by the dermal route has a moderate local sensitivity (up to 2.5 percent), it is potentially an important parameter because data on chronic toxicity or carcinogenicity by the dermal route are generally not available and therefore inter-route extrapolation is the rule. Current estimates, based on models and experiments using laboratory animals and cadaver skin, are relatively uncertain for some chemicals. However, there is no reason to believe that dermal uptake would be different in a school environment than in other exposure scenarios, and OEHHA has no current plans for dermal uptake research. The uncertainty is in both directions.

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**REFERENCES**

DTSC, 1994. Preliminary Endangerment Assessment Guidance Manual, State of California, Environmental Protection Agency, Department of Toxic Substances Control.

DTSC, 1992. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (Second printing, 1999), State of California, Environmental Protection Agency, Department of Toxic Substances Control.

EPA, 1989; U.S. Environmental Protection Agency Risk Assessment Guidance for Superfund, Human Health Evaluation Manual

EPA, 1996. Soil Screening Guidance User's Guide, (EPA540/R-96/018), OSWER, July, 1996 <http://www.epa.gov/superfund/resources/soil/index.htm>

U.S. Environmental Protection Agency (EPA), 2002; Child-Specific Exposure Factors Handbook, Interim Report, September, 2002, National Center for Environmental Assessment, Washington, DC; EPA-600-P-00-002B available at <http://www.EPA.gov/NCEA>

U.S. Environmental Protection Agency (EPA), 1989; Exposure Factors Handbook, May, 1989 Update, National Center for Environmental Assessment, Washington, DC; EPA600/8-89/043 available at <http://www.EPA.gov/NCEA>

EPA, 2003 Johnson and Ettinger (1991) Model for Vapor intrusion into Buildings (revised) [http://www.epa.gov/superfund/programs/risk/airmodel/johnson\\_ettinger.htm](http://www.epa.gov/superfund/programs/risk/airmodel/johnson_ettinger.htm)

U.S. Environmental Protection Agency (EPA), 1997; Exposure Factors Handbook, National Center for Environmental Assessment, Washington, DC; EPA-600-P-00-002B available at <http://www.EPA.gov/NCEA>

Kissel, J., K. Richter, and R. Fenske, (1996), Field Measurements of Dermal Soil Loading attributable to Various Activities: Implications for Exposure Assessment. Risk Anal. 15(1)116-125.

Kissel, J., J. Shirai, K. Richter, and R. Fenske, (1998), Investigation of Dermal Contact with Soil in Controlled Trials. J. of Soil Contamination 7(6) 737-752

Klepeis, NE, Nelson WC, Ott WR, Robinson JP, Tsang AM, Switzer P, Behar JV, Hern SC, Engelmann WH, The National Human Activity Pattern Survey (NHAPS): A Resource for Assessing Exposure to Environmental Pollutants, Journal Of Exposure Analysis and Environmental Epidemiology, 11 (3): 231-252 May-Jun 2001.

OEHHA, 2000; California Office of Environmental Health Hazard Assessment; Air Toxics Hot Spots Program Risk Assessment Guidelines: Part IV - Technical Support Document for Exposure Assessment and Stochastic Analysis

OEHHA, 2002 Office of Environmental Health Hazard Assessment, California Environmental Protection Agency

OEHHA, 2003; "SCHOOLSCREEN.xls" Draft Schools Risk Screening Model, a Spreadsheet Adaptation of the Guidance for Assessment of Exposures and Health Risks at Existing and Proposed School Sites, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, February 5, 2004

RTI 2003a, Portable Classrooms Study

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RTI 2003b, Addendum To The California Portable Classrooms Study Soil Sampling And Metals Analyses

University of California, Davis, 1994, Caltox™, a Multimedia Total Exposure Model for Hazardous Waste Sites - Spreadsheet Users Guide version 1.5

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**Appendix 1: Summary and Interpretation of Results of RTI Study**

OEHHA-recommended values for three exposure parameters in the schools risk assessment model are based on RTI (2003):

- 1) Composition of interior surface dust with respect to outdoor soil
- 2) Classroom ventilation rates
- 3) Days of instruction per year

Composition of interior surface dust with respect to outdoor soil

RTI investigated the relationship of the concentration of nine elements, (As, Cd, Cr, Cu, Pb, Ni, Se, Vd, Zn) in soil at 67 school sites to the concentration of those elements in classroom floor dust (RTI, 2003). The concentrations of three of the nine elements, chromium, nickel, and vanadium, were significantly correlated ( $r = 0.55-0.64$ ,  $p < 0.001$ ) between these two media. The 95 percent upper confidence limits (UCL<sub>95</sub>) on the median dust/soil concentration ratios for these three elements were 1.90, 2.54, and 1.53, respectively (Table A-1). OEHHA, therefore, recommends a default value of 2 for the "transfer factor from soil to indoor dust" (TF<sub>SD</sub>), based on the mean of the three median UCL<sub>95</sub>s.

**Table A-1: Indoor Dust to Soil Ratios**

	Correlation	Significance	Median Ratio	95% C.I.
Arsenic	0.19	0.10	1.88	1.62-2.05
Cadmium	0.06	0.58	2.95	2.51-4.00
Chromium	0.64	<b>&lt;0.001</b>	<b>1.71</b>	1.48-1.90
Copper	0.03	0.81	2.95	2.39-3.48
Lead	0.17	0.13	3.07	2.27-3.81
Nickel	0.58	<b>&lt;0.001</b>	<b>2.18</b>	1.81-2.54
Selenium	0.19	0.09	0.20	NA <sup>1</sup> -0.73
Vanadium	0.55	<b>&lt;0.001</b>	<b>1.37</b>	1.26-1.53
Zinc	0.07	0.55	9.67	7.05-13.64

<sup>1</sup> LCL on ratio not calculated due to values below the detection limit.

Other elements studied had lower correlations, but with the exception of selenium and zinc, still had similar median dust/soil ratios in the range of 1.88 to 3.07. The ratio for selenium is not reliable because of failure to detect selenium in some samples. The high dust/soil ratio for zinc is unclear, but could be the result of some (unknown) indoor source of zinc.

Classroom Ventilation Rates

RTI (2003a) reported average outdoor airflow into the classrooms of 0.8737 c.f.m. per ft<sup>2</sup> of floor area (95% C.I. = 0.7894-0.9579)(Table A-2). No data were collected on classroom volume. Assuming a ceiling height of 10 feet, this would yield an average classroom ventilation rate of 0.087 (95% C.I. = 0.079-0.096) c.f.m. per ft<sup>3</sup> (i.e. changes per minute). Multiplying by 60 min/hr yields a mean exchange rate of 5.2 changes per hour (95% C.I. =

4.7-5.7). OEHHA recommends a default air exchange rate of 4.7/hr, based on the 95 percent LCL on the mean.

**Table A-2: Classroom Ventilation Rates**

Parameter	units	mean	95% C.I.	5-95 percentile
Outdoor air flow/sq.ft.	cfm/ft <sup>2</sup>	0.8737	0.7894-0.9579	0.3179-1.3854

Days of Instruction per year

Table A-3 shows the reported number of planned school days for the current school year for the 54 California schools that interpreted the question correctly (RTI, 2003b). The bimodal distribution suggests that a single value may not adequately represent the data. Therefore OEHHA recommends 180 days per year for traditional 3-season schools and 232 days per year for year-round schools.

**Table A-3: Days of Instruction per year**

<u>Number of Days</u>	<u>Number of Schools</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Less than 180 days	9	16.7	16.7
180 days	34	63.0	79.6
181 to 187	8	14.8	94.4
188 to 227	0	0	94.4
228 to 238	3	5.6	100.0

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A1-2

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### Appendix 2: Comments and Responses

#### UNIVERSITY OF CALIFORNIA PEER REVIEWER COMMENTS

**William W Nazaroff**  
Department of Civil and Environmental Engineering  
University of California, Berkeley

##### OVERALL SUMMARY COMMENT

Overall, I found the document clear, generally well organized and easy to follow. The goals, methods, and limitations of the approach are well expressed. The document is also concise, which is a virtue. I have a concern about the overall scope of the document. Some potentially important exposures are not being considered and the justification for the omission is unclear. See below for detailed discussion.

Technically, the equations for assessing exposure and analyzing risk are generally appropriate for a screening-level assessment. Some improvement in how the parameters are presented and discussed would strengthen the report. I like that a sensitivity analysis was conducted and is presented. I think that the identification of parameters that contribute most to uncertainty should be expanded. A few concerns and several specific suggestions for improvement are described in greater detail in the following section of this review.

##### DETAILED COMMENTS

###### 1. Comment - Scope of Guidance (page 8)

"Exposures to chemicals in building materials and furnishings and chemicals used in schools are beyond the scope of this guidance." It is not clear that excluding such exposures is responsive to the legislation that mandated this document. I find nothing in Health and Safety Code Section 900-901 that justifies such exclusion. Even if this can be justified, some other exposures could be of considerable concern and are neither addressed in the document nor specifically excluded. In particular, exposure to emissions from diesel school buses and to herbicides or pesticides used on the school grounds should be considered.

##### Response

Health and Safety Code Section 901(f) states that OEHHA is to develop guidance for assessing exposures and risks at existing and proposed schoolsites. The following text has been added to the Guidelines to clarify this issue (see page 6): "Building materials and indoor products may be important sources of indoor exposure to toxic constituents at schools. It may be appropriate to include these sources of chemical exposures in the overall assessment of overall hazards and risks at existing schools. Typically these assessments would be based on measured atmospheric concentrations in classrooms and other indoor areas, and estimated risks, using the same exposure parameters, would be added to site-related risks. Hazards would be additive among chemicals sharing a common target organ

and/or mode of action." See also added text on page 2: "Representative measured contaminant concentrations in various environmental media may be used in lieu of modeled values."

##### Comment

In the section "Schools Conceptual Site Model" it is stated that "this model considers contaminated soil and shallow ground water as primary source media." In fact, the exposure assessment equations include inhalation exposure to contaminants that originate offsite (such as at an upwind freeway or industrial facility). The inclusion of these sources should be clarified in this section.

##### Response

The wording on page 8 has been revised to include the following sentence: "As depicted in Figure 1, this model considers contaminated soil, shallow ground water, and unspecified off-site sources as primary source media."

##### Comment

Table 1 — Exposure Pathways (p. 11) Pathways 9 and 10 can lead to exposures by inhalation of indoor air as well as outdoor air. The equations incorporate this pathway. The column "exposure medium" should be modified to reflect this.

##### Response

Figure 1 is revised to reflect this change: an arrow now indicates that outdoor particulate and vapor-phase contaminants can move indoors.

##### Comment

3. The term "Fraction of school soil/dust ingestion that occurs indoors" (FI p. 12) appears in a few pathway equations, but is not explicitly defined in the later section on Exposure Parameters.

##### Response

The text on page 21 has been revised to include the following definition: Fraction indoors (FI) is the estimated fraction of the daily school-related dermal and ingested soil/dust exposure that is acquired indoors. It is calculated as  $1 - FO$ .

##### Comment

Concentration of PM10 in outdoor air, PM10 (p. 12). In the pathway equations, this parameter needs to be more carefully defined. It is the PM10 concentration on-site because of emissions from site soil. In fact, this will be a small fraction of the total PM10 concentration. Failure to clarify the distinction could cause important confusion. Also, below the equation for pathway 5, the CPM10 parameter should have its units specified.

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**Response**

The definition of PM<sub>10</sub> has been revised as follows:

PM<sub>10</sub> = Respirable particle load for outdoor air due to resuspension of site soil (gPM/Lair).

The units "µg/g" have been added to the definition of CPM10 in equation 5.

**Comment**

5. Respirable particle load for indoor air, SF (p. 12 and p. 15). The definition of this parameter should be more carefully delimited. It refers to the indoor air concentration of crustal materials that originated on the site.

**Response**

The equation has been revised to treat indoor suspended particles as a function of indoor dust, which is, in turn, a function of outdoor soil. The default transfer factors are one (1) and two (2), respectively (See pathway 8 page 15).

**Comment**

6. Pathway 8 should include inhalation of indoor air (p. 13). If a chemical is vaporized from soil into outdoor air, then that chemical can enter indoor air with ventilation and be inhaled there. This is a distinct pathway from direct intrusion of the vapor into the building from the soil (as addressed by the Johnson & Ettinger model). This pathway, therefore, should have a term (BI\*TI + BO\*TO) in place of (BO\*TO).

**Response**

The term (BI\*TI + BO\*TO) has been added to pathway 8 (See page 15).

**Comment**

7. Clarify that penultimate paragraph on p. 14 refers to the case of noncarcinogens only.

**Response**

We presume that the comment refers to the following paragraph:

Each of these equations gives a pathway-specific annual average daily dose of the chemical in question. The pathway-specific annual average daily dose is divided by the route-specific reference dose (RfD) to arrive at the pathway-specific hazard quotient (HQ). The pathway-specific HQs are added to give the chemical-specific HQ. In a screening analysis, the chemical-specific HQs for each chemical are added to give the Hazard Index. In a more detailed (tier 2) analysis, target organs and mechanisms of toxic action may be considered in determining the appropriateness of adding the HQs for individual chemicals.

The paragraph refers to non-carcinogenic effects of both carcinogenic and non-carcinogenic chemicals. Carcinogenicity is handled separately.

**Comment**

8. Provide a logical ordering of Intermedia Transfer Coefficients and Exposure Parameters (p. 15-21). It would be easier to follow the developments if the presentation and discussion of the parameters had a transparent logical structure. For example, a table could be provided

A2-3

that listed all of the parameters in alphabetical order (according to the symbols), defined them in words (1 line), and listed the page number on which the parameter value is discussed.

**Response**

A column has been added to tables 1 and 2 to indicate where each parameter is discussed.

**Comment**

9. Clarification of transfer factor from soil to outdoor particulate matter, TFPM/S (p. 15). The text should make clear that this is the transfer factor that relates the contaminant concentration in soil to the contaminant concentration in the outdoor PM that results from suspension of site soils. Because of windborne transport, the total PM10 level on site would often be much larger than that resulting from releases on site.

**Response**

The TFPM/S has been re-defined as the ratio of the concentration of contaminant in outdoor PM<sub>10</sub> originating from site soils to the concentration of contaminant in soil (see page 13).

**Comment**

10. Default parameters for Johnson and Ettinger model (p. 15): I believe that the default conditions for the J&E model are appropriate for residential construction but may not be for schools. Details like the height of the building, the land area it covers, and the ventilation rate may be different between schools and residences. This issue requires some attention, at least at the level of further discussion in the document.

**Response**

The air exchange rate has been increased to 4.7 changes per hour (6.13e+5 cm<sup>3</sup>/sec) based on (RTI, 2003)

**Comment**

11. Fraction at school, FS (p. 17): Clarify that this parameter represents the fraction of a school day (as opposed to an average day) that an exposed individual spends at school.

**Response**

Revisions on pages 13 and 20 indicate that FS represents the fraction of a school day.

**Comment**

12. Update NHAPS data and reference? (p. 19): Assuming that the appropriate information is contained there, the reference to Tsang and Klepeis (not "Klepis") should be updated to the following archival report: Klepeis NE, Nelson WC, Ott WR, Robinson JP, Tsang AM, Switzer P, Behar JV, Hern SC, Engelmann WH, The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants, JOURNAL OF EXPOSURE ANALYSIS AND ENVIRONMENTAL EPIDEMIOLOGY, 11 (3): 231-252 MAY-JUN 2001.

**Response**

A2-4

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

The reference has been changed.

### Comment

13. Table 3 typographical error: Change “Cm” to “cm2” in 6 places in the second column.

### Response

The error has been corrected.

### Comment

14. Strengthen Uncertainty Analysis: The sensitivity and uncertainty analysis is a welcome part of this report. Table 4 presents an important, but only partial picture of the degree to which different parameters affect the outcome, by indicating the change in intake per unit change in each parameter. The other important factor, recognized in the text, is how variable and how uncertain the parameters are themselves. Certain parameters vary only over narrow ranges, e.g. a factor or two or less. Other parameters can vary over orders of magnitude. The parameters that are narrowly variable and well characterized (so possessing low uncertainty) are not large contributors to uncertainty in the outcome, regardless of the sensitivity of the outcome to the parameter. I would like to see Table 4 complemented by another table that provides some indication of the variability of each parameter, and the likely degree of uncertainty in its determination. The combination of all of these would provide an overall sense of which of the parameters is most important in the overall uncertainty of the risk assessment.

### Response

An “uncertainty” column has been added and the discussion revised (see page 28).

### Comment

15. Improve reference list: Wherever possible, web links should be provided to government reports.

### Response

Web links have been provided where appropriate.

A2-5

Michael T. Kleinman  
Department of Community and Environmental Medicine  
University of California, Irvine

### General Comments:

This guidance is intended to:

- Support assessment of chemical exposures and health risks at existing and proposed school sites,
- Characterize uncertainty in assessing exposure and risk in the school setting,
- Suggest which areas are most in need of further research.

To this end, the guidance addresses the differences between children and adults, and between the school setting and other settings. Recognition is given to the concept that children differ from adults anatomically, physiologically, and behaviorally in ways that affect their exposure to environmental contaminants. A modeling approach is used to predict exposures and risks to preschoolers, students, teachers and other school personnel, and their offspring, from chemicals in the soil, shallow ground water, and air at the school site. A spreadsheet is provided which facilitates the application of the model to estimating exposures. Overall the guidance provides an integrated exposure assessment approach, and achieves many of the objectives for the guidance. There are, however, some areas in which the guidance could have been improved. Some examples of these are provided below.

### Comment

Other sources – the document states “in some cases, it may be appropriate to add in additional sources of chemicals in the environment. For example there may be off-site emissions that may impact on-site concentrations”. It is not clear what those sources might be and some concrete examples would be helpful.

### Response

The following language has been added to the Guidelines to clarify this issue (see page 11):  
*“Atmospheric emission sources within ½ mile of the site which have the potential to contaminate on-site air may be important in estimating overall toxic exposures. Examples could include fixed facilities with known emissions and mobile sources such as highways, heavily traveled streets, or vehicle loading areas.”*

### Comment

1. In addition, it is stated that “Exposures to chemicals in building materials and furnishings and chemicals used in schools are beyond the scope of this guidance” No justification is given as to why these on-site sources would not be considered while some unspecified off-site sources would be included. An example that comes to mind would be radon from building materials, formaldehyde from floor coverings etc. The guidance should provide a generalized approach as to how these factors could be included in a total exposure assessment.

A2-6

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### Response

The following text has been added to the Guidelines to clarify this issue (see page 12):  
"Building materials and indoor products may be important sources of indoor exposure to toxic constituents at schools. It may be appropriate to include these sources of chemical exposures in the overall assessment of overall hazards and risks at existing schools. Typically these assessments would be based on measured atmospheric concentrations in classrooms and other indoor areas, and estimated risks, using the same exposure parameters, would be added to site-related risks. Hazards would be additive among chemicals sharing a common target organ and/or mode of action."

### Comment

2. Target Organs – The document states "Hazard quotients and incremental risks are estimated for each chemical; then the hazard quotients and incremental risks associated with the individual chemicals are added to arrive at the total hazard index and total risk. If the total hazard index does not exceed one, then it may be assumed that the non-cancer toxic effects are unlikely and further analysis of non-cancer effects is not necessary. If the total hazard index exceeds one, it may be useful to separate chemicals by target organ and/or mode of action and add the hazard quotients of only those chemicals that are likely to act in an additive manner. This target organ/mode of action analysis should be documented." Having said that it would have been useful for the document to specify precisely how such a target organ approach might be addressed, at least in general terms. Thus it would be very useful if the worksheet of potential contaminants could be indexed with respect to target organs to facilitate the computation of target organ specific hazard indices as suggested in USEPA OAQPS 2001.

### Response

We agree that it would be useful if the worksheet of potential contaminants were indexed with respect to target organs to facilitate the computation of target organ specific hazard indices; this is something we will address as resources permit.

### Comment

3. The approach taken to distinguish between characteristics of children in different age groups is reasonable and appropriate.

### Response

No response

### Comment

4. The factor that lowers enthusiasm for this guidance the most is that it treats school exposure for the most part in a vacuum, i.e. personal exposure of individuals also includes exposures incurred away from school and from other sources. The risks from the school exposures, if any, are only a part of the overall risk. While it may be beyond the scope of this specific document to estimate these risks, it should be clearly expostulated within the document that children in different parts of California have different background exposures. It would seem to be important that these be considered at least in part before determining that exposures to be incurred in a school setting are

A2-7

acceptable. Some suggestions should be included as to how these background risks can be estimated – at least on some average level. There are some modeling approaches (ASPEN) and emissions inventories (Toxic Release Inventory) that could be used to establish and update potential community background levels for specific chemicals found on the school site so that the school exposure does not represent the "straw that breaks the camel's back".

### Response

A given incremental dose of a toxic constituent that would otherwise be of no concern, may be a concern if the receptor is already receiving a background dose of the constituent near the toxic threshold. For this reason, risk managers may wish to take background exposures into account in their decision-making process. This is suggested in new language added to the Guidelines (see page 12). The "camel's back" phenomenon would impact only those sites where risk management decisions are driven by non-carcinogenic effects. Since carcinogens are treated as exhibiting no threshold, background exposure levels would not affect the incremental risk posed by the contamination at the school site.

### Comment

5. The document states "Concentration of site-related particulate material less than 10 microns in diameter in outdoor air (PM<sub>10</sub>)". OEHHA recommends a default value of 1.8 E-9 g PM/L (1.8 µg/m<sup>3</sup>). This value is based on the EPA Soil Screening Levels document (EPA, 1996)". This value seems to be very low when contrasted with measurements of resuspended dust in California made by the Air Quality Management District. On an annual basis resuspended surface material contributes about 20-30 percent of PM<sub>10</sub>. Given the average PM<sub>10</sub> concentration in California is higher than that in most communities in the US, a more realistic default value would be on the order of 5 to 10 µg/m<sup>3</sup>. The authors should consider increasing this default value and re-estimating the sensitivity to this parameter.

### Response

The proposed value is for respirable particulate matter resuspended *from the site*. If the suggested value of 5 to 10 µg/m<sup>3</sup> represents total resuspended surface material, then the proposed value of 1.8 µg/m<sup>3</sup> would represent 18 to 36 percent of the total, which we believe is a conservative estimate of the fraction of total resuspended surface material that would be from the site.

### Comment

The use of the spreadsheet was mentioned but it would be extremely helpful to provide the documentation and instructions as an appendix to the guidance document.

### Response

A new sheet "User's Guide" has been added to the spreadsheet, in order to clarify how the spreadsheet should be used. We have avoided making the spreadsheet part of the Guidance in order to avoid the implication that the spreadsheet must be used in order to comply with the guidance.

A2-8

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### Comment

I attempted to use the spreadsheet, and inserted Soil Cleanup Levels for several toxic compounds. I estimated that at a benzene level of 60 µg/kg soil the exposure produced a cancer risk of  $2.5 \times 10^{-5}$ . Other toxic compounds produced higher values. I presume that I did the calculations incorrectly but it would be useful to check the spreadsheet's output with values taken from some set of soil cleanup guidelines.

### Response

The spreadsheet gives a single-highest-year risk estimate of  $1.6\text{e-}8$  for 1-2 year-olds at a **benzene level of 60 µg/kg soil**. There is reason to expect that the estimated risk at a soil concentration corresponding to a Soil Cleanup Levels would not be  $10^{-6}$  if the Soil Cleanup Level is based on a scenario other than the school scenario. The legislature mandated that we develop methodology for estimating risk at schools based on the assumption that risk at schools would be different from risk associated with residential, commercial, and other scenarios.

### COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

December 20, 2002 – January 30, 2003

AND PUBLIC WORKSHOP, January 24, 2003

Dr. Mark C. Rigby, Tetra Tech

### Comment

"The purpose of this [PEA] screening evaluation is to provide the risk manager with an estimate of the potential chronic health hazard from contamination at the site. The anticipated use of this screening evaluation is to assist the risk manager in deciding whether further site characterization, risk assessment, or remediation is necessary." The objective of the PEA at a proposed school site is to provide a timely and health-protective screening level evaluation, as stated in the quote above from the PEA manual.

### Response

The draft guidance document was prepared to comply with California Health and Safety Code Section 901(f), which requires OEHHA to develop and publish a guidance document for use by the Department of Toxic Substances Control (DTSC) and other state and local environmental and public health agencies to assess exposures and health risks at existing and proposed school sites. Although DTSC may choose to use the Guidance within the PEA framework, there is no such requirement in the law. Other agencies may use the Guidance in other contexts such as CEQA. The law mandates the use of "appropriate child-specific routes of exposure unique to the school environment, in addition to those in existing exposure assessment models" and the "identification of uncertainties in the risk assessment guidance and those actions that should be taken to address those uncertainties."

A2-9

### Comment

The exposure equations are not in the standard form given in U.S EPA's RAGS and use a different terminology.

### Response

While some minor aspects may differ, the general form of the equations is consistent with U.S EPA's RAGS, i.e. the concentration in a contact medium times a contact rate with that medium times an absorption rate to give a daily dose, which, when multiplied by an exposure frequency (expressed as a fraction of a year) gives an annual average daily dose. The annual average daily dose, multiplied by exposure duration divided by averaging time gives a lifetime average daily dose.

### Comment

The dermal exposure equation provided in the draft guidance is more complicated than that given in RAGS.

### Response

The draft guidance follows the methodology found in the EPA Children's Exposure Factors Handbook, which more accurately describes the way soil adheres to skin in a "real-world" situation.

### Comment

Several exposure parameters not in RAGS are used, for which the default factor is assumed to be 1. Eliminating these exposure factors would simplify and expedite the use of the guidance and would not change the outcome from the default scenario. The exposure parameters that with a default of 1 are: AI AD TFSD TFPM/S TFI/O Ain. The indoor dust pathway, as provided in the default form given in the draft guidance, does not differ from the outdoor dust/soil exposure pathway. As such, it is redundant.

### Response

A guiding principle in developing this guidance was that implicit assumptions should be made explicit. Besides making the methodology more transparent, this allows for replacing the value of one (1) with a chemical-specific value other than one, when new data support an alternative value. The legislative mandate requires identification of uncertainties in the risk assessment guidance and those actions that should be taken to address those uncertainties. These transfer factors are uncertain and therefore must be included in order to capture the uncertainty. A discussion of the factors mentioned in the comment follows:

TFSD, TFPM/S, and TFI/O are transfer factors, not exposure parameters. Since RAGS does not deal with intermedia transport, these parameters would not be expected to be in RAGS.

TFSD - OEHHA currently recommends a default value of 2 for TFSD, based on the results of recent research.

A2-10

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

AD - Absorption by the dermal route is found in RAGS and chemical-class-specific values are proposed.

AI and AI - Absorption by the inhalation and ingestion routes have implicit values of unity in RAGS. This guidance makes the value of unity explicit.

**Comment**

Exposure parameters are given for 1 year intervals for children. This requires that the consultant derive appropriate exposure parameters for each site de novo, demonstrate that they are appropriate, and that DTSC approve them. This may lengthen the PEA process for each site. To expedite the process, default exposure parameters could be provided for the most frequent types of schools, e.g. pre-schools, Kindergartens, Elementary schools, Middle schools w/elementary schools, Middle schools, High schools w/middle schools, and High Schools. Providing the yearly exposure parameters in an Appendix would allow consultants to derive specific exposure parameters for those cases that did not fit into the defaults given above.

**Response**

Default exposure parameters are provided for each year from birth through age seventeen and for adults. The burden of gathering this information is not placed on the user. Default parameters for multi-year periods were considered and rejected because this method would base the hazard index on an average exposure for a multi-year time period and would not capture the single highest year. Furthermore, the use of individual years gives the assessor and the reviewing agency more flexibility. While individual years can be aggregated into groups to match a proposed exposure scenario, multi-year bins can not be easily disaggregated. Disaggregation would be necessary if the assessment period did not match the exposure scenario. For example some districts have elementary schools covering grades K-6, while others have primary schools from K-3 and middle schools from 4-6 on different sites.

**Comment**

The draft guidance provides a simplified equation for determining outdoor air concentrations of volatiles that have migrated from subsurface soil or shallow groundwater sources. The consultant need only supply the chemical concentration in soil/groundwater and the chemical-physical properties. For indoor air, however, the draft guidance states that the Johnson and Ettinger model from USEPA should be used, but no defaults are supplied. The PEA process would be greatly expedited if default building and soil properties, as well as contaminant depths, were supplied. If this were done, a simplified model could be derived (akin to the VF emissions model) that only requires the input of chemical concentration in soil/groundwater and chemical-physical properties.

**Response**

OEHHA is proposing a default air exchange rate of 4.7 changes per hour (613,426 cm<sup>3</sup>/sec in the EPA indoor air model with the default building volume – any changes in building volume would have to be accompanied by corresponding changes in flow rate to maintain the same exchange rate), based on recent studies of California classrooms (RTI, 2003). (see Guidance

page 17). Default parameter values will be considered for other parameters. DTSC's indoor air working group is developing recommended default values for some parameters.

**Comment**

To expedite the PEA process as much as possible, default simplified risk assessment equations could be provided. Such equations were provided in the original PEA manual (DTSC 1999) and only require the input of chemical concentrations and toxicity values (in addition to any modeling necessary to calculate concentrations).

**Response**

Default risk assessment equations are provided. They are not simplified, but they only require the input of chemical concentrations in selected media and toxicity values (which are provided for some chemicals). These risk assessment equations have been incorporated into a spreadsheet, which can be recalculated virtually instantaneously by most computers. While it would be possible to further simplify the equations by collapsing all exposure parameters into a single pathway exposure factor as the PEA does, this would sacrifice transparency and the ability to substitute case-specific parameters in a tier 2 assessment when appropriate.

**Comment**

The draft guidance includes the assessment of risks from the migration of offsite dusts and vapors to the school site. This is more appropriately addressed in an EIA/EIS. Risk assessments normally evaluate the risks from contaminants that originate at the site.

**Response**

This guidance may be used in a variety of contexts including environmental impact analysis. For some purposes, some pathways in the model may not be appropriate. Pathways may be eliminated with the approval of the reviewing agency.

**Comment**

If local background is evaluated in the risk assessment, it is to subtract the risks from local background from the site-specific risks

**Response**

The guidance addresses methodology for estimation of dose and risk from environmental contamination at a proposed or existing school site. Contaminant source allocation, and management of contamination are in the domain of risk management, and are outside the scope of this guidance.

**Comment**

Draft USEPA guidance is cited as the source of some of the information. However, by its very nature, draft guidance is rather labile.

**Response**

The guidance referred to is now interim final.

A2-11

A2-12

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Bill Piazza, Los Angeles Unified School District (LAUSD)

**Comment**

In general, the District agrees with the refined methodology recommended in the draft assessment protocol which allows consideration of "reasonable" exposures anticipated to occur at school sites. Nevertheless, the methodology is unnecessarily specific in its attempt to quantify risk. The District contends that until toxicity factors are developed for school aged children, the quantification of risk for each grade level will not reveal a significant difference over the risk value predicted with average exposure factors for a given occupancy.

**Response**

For some chemicals, the estimated dosage in the first year of life is as much as 2.7 times the average for birth through age seventeen. OEHHA considers a 2.7-fold difference worth considering. And once the algorithms are incorporated into a spreadsheet, the extra calculations are little, if any, extra effort.

**Comment**

In addition, the methodology is not consistent with existing assessment methodologies utilized for the Safe Drinking Water and Toxic Enforcement Act (Proposition 65), Air Toxic "Hot Spots" Information and Assessment Act (AB 2588) and related California Air Resources Board (ARB) assessment activities prepared under the auspices of the Toxic Air Contaminant Identification and Control Act (AB 1807). The District's concern is exemplified with the pending adoption of ARB's Regulation Order to limit school bus idling and idling at schools. The purpose of the air toxic control measure is to "reduce public exposure, especially school aged children's exposure" to pollutants by "limiting unnecessary idling" of specified vehicular sources "at and around schools and while riding school buses and other types of school transportation." Please note that the ARB utilized the assessment methodology outlined in OEHHA's Air Toxic Hot Spot Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Assessment and Stochastic Analysis to establish a set of defined control measures. The specific exposure assumptions are presented in ARB's Staff Report: Initial Statement of Reasons (ISOR), Appendix C: Idling Diesel School Bus Health Risk Assessment Methodology. The District believes that due to the regulatory nature of the assessment, which identifies operational controls for school bus owner/operators to actually reduce school-based exposures, justifies its use as an appropriate methodology. Nevertheless, the District is aware that one may argue that the various State agencies and their associated regulatory programs require different methodologies to assess risk. As such, assumptions such as exposure frequency and duration may differ producing varying risk values for a given exposed population. However, the District believes that a school is a school regardless of the specific regulatory program. To argue that one agency should assess school exposures with one set of assumptions while another consider different exposure variates for the same occupancy, promotes a lack of consistency between the various State boards and departments and does little to encourage the harmonization in the practice of risk assessment within Cal/EPA. As a result, the assessment of a school-based occupancy must be consistent with all programs which quantify risk for this sensitive subpopulation.

A2-13

**Response**

This Guidance also utilizes some of the assessment methodology and parameter values outlined in OEHHA's Air Toxic Hot Spot Program Risk Assessment Guidelines, Part IV, Technical Support Document for Exposure Assessment and Stochastic Analysis. To the extent that there are differences, these reflect the different mandate for this program.

**Comment**

1. Units of measure are not consistent with industry standard. This may present an unnecessary source of error upon unit conversion and present some difficulty in reviewing empirical data and related workbook calculations. For example:

- Soil concentration (e.g., ug/g to mg/kg)
- Particulate airborne concentrations (e.g., ug/l to ug/m3)
- Volatile airborne concentrations (e.g., ug/l to ug/m3))
- Cancer Potency Factors (e.g., ug/kg/day to mg/kg/day)

**Response**

- Soil concentration units have been changed to mg/kg
- Particulate and volatile airborne concentrations have been changed to mg/l
- Cancer Potency Factors units have been changed to (mg/kg/day)-1

**Comment**

2. Calculation of the hazard index does not consider toxicological endpoints. This is not consistent with existing guidance (OEHHA, 2000). The inclusion of this refinement is most relevant as many removal actions currently undertaken by the District are based upon screening values. As such, unity may be exceeded necessitating an unwarranted response action. The ability to readily identify and quantify the hazard index should be included in the proposed methodology. The following excerpt from U. S. EPA's Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (RAGS) underscores the viability of the District's concern regarding dose additivity. Another limitation with the hazard index approach is that the assumption of dose additivity is most properly applied to compounds that induce the same effect by the same mechanism of action. Consequently, application of the hazard index equation to a number of compounds that are not expected to induce the same type of effects or that do not act by the same mechanism could overestimate the potential for effects, although such an approach is appropriate at a screening level. This possibility is generally not of concern if only one or two substances are responsible for driving the HI above unity. If the HI is greater than unity as a consequence of summing several hazard quotients of similar value, it would be appropriate to segregate the compounds by effect and by mechanism of action and to derive separate hazard indices for each group.

**Response**

Calculation of the hazard index does consider toxicological endpoints. See pages 8 and 25.

**Comment**

3. Several exposure variates differ from existing guidance (OEHHA, 2000). Many are taken from a draft guidance document (U.S. EPA, 2000). If these values are more appropriate, then OEHHA should revise current guidance for consistency. For example:

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

- Skin surface area (U.S. EPA, 2000)
- Breathing Rates (not consistent with OEHHA recommended values)
- Body Weights (U.S. EPA, 2000)

**Response**

The Child-Specific Exposure Factors Handbook is now a citable Interim Report

The skin surface area data were generated in a setting similar to a school environment (day care) and are therefore relevant for school exposure estimation.

The OEHHA-recommended breathing rates (Table 3.22, in Technical Support Document for Exposure Assessment and Stochastic Analysis, OEHHA, September 2000) are for assessment of long-term average exposures. They are not activity-specific as required.

The recommended body weights have been revised to agree with Tables 10.1 (staff) and 10.3 in (Technical Support Document for Exposure Assessment and Stochastic Analysis, OEHHA, September 2000).

**Comment**

4. Exposure times should be reviewed and revised, as appropriate, following input from school district personnel. Stakeholder input, rather than U.S. EPA's draft documentation, should be utilized to develop viable exposure times. For example, OEHHA assumes most kindergarten students spend over nine hours per day at school. To the contrary, most kindergarten students spend no more than 4 hours per day at school.

**Response**

The guidance has been revised to reflect recent survey data (RTI, 2003) with respect to exposure frequency. Children 0-6 may be in day care for a full school or work day.

**Comment**

5. Uncertainty with the use of the Johnson and Ettinger Model should be discussed. OEHHA should address concerns raised regarding the model's accuracy before recommending its use.

**Response**

Uncertainty associated with the use of the Johnson and Ettinger Model is discussed in the Uncertainty section.

**Comment**

If utilized, the model must be programmed to account for vapor intrusion into institutional (e.g., Department of Education approved) buildings and not a single-family residence. For example, a default air exchange rate of 0.45 per hour is inappropriate for institutional buildings with markedly higher ventilation rates which range from 4 to 7 air changes per hour (e.g., 50 CFM per person).

**Response**

The guidance has been revised to reflect recent survey data (RTI, 2003) with respect to default air exchange rates.

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**Comment**

6. The school's conceptual site model must be further defined. School-based exposures must be plausible and likely to occur for a given occupancy. A discussion similar to U.S. EPA guidance must be included to further define "reasonable" exposure pathways. The District's recommendation is exemplified by the following excerpt from RAGS. There are two steps required to determine whether risks or hazard indices for two or more pathways should be combined for a single exposed individual or group of individuals. The first is to identify reasonable exposure pathway combinations. The second is to examine whether it is likely that the same individuals would consistently face the "reasonable maximum exposure" (RME) by more than one pathway. Identify exposure pathways that have the potential to expose the same individual or subpopulation at the key exposure areas evaluated in the exposure assessment, making sure to consider areas of highest exposure for each pathway for both current and future land uses (e.g., nearest downgradient well, nearest downwind receptor). For each pathway, the risk estimates and hazard indices have been developed for a particular exposure area and time period; they do not necessarily apply to other locations or time periods. Hence, if two pathways do not affect the same individual or subpopulation, neither pathway's individual risk estimate or hazard index affects the other, and risks should not be combined. Once reasonable exposure pathway combinations have been identified, it is necessary to examine whether it is likely that the same individuals would consistently face the RME as estimated by the methods described in Chapter 6. Remember that the RME estimate for each exposure pathway includes many conservative and upper-bound parameter values and assumptions (e.g., upper 95th confidence limit on amount of water ingested, upper-bound duration of occupancy of a single residence). Also, some of the exposure parameters are not predictable in either space or time (e.g., maximum downwind concentration may shift compass direction, maximum ground-water plume concentration may move past a well). For real world situations in which contaminant concentrations vary over time and space, the same individual may or may not experience the RME for more than one pathway over the same period of time. One individual might face the RME through one pathway, and a different individual face the RME through a different pathway. Only if you can explain why the key RME assumptions for more than one pathway apply to the same individual or subpopulation should the RME risks for more than one pathway be combined.

**Response**

All pathways included in the guidance may affect the same child with two exceptions: The breast milk pathway does not affect children above one year of age, and the soil ingestion pathway does not affect children less than one year of age. Thus, these pathways are not additive. A column has been added to Table 2 indicating for each exposure parameter whether it is mid-range or upper end, and some discussion of upper end versus mid-range has been added to the uncertainty section on page 30.

**Comment**

Some discussion on acceptable level of risk should be introduced. OEHHA administers Proposition 65 which supports the State's "level posing no significant risk" of one in one hundred thousand (1.0E-05), not the value of one in one million (1.0E-06) as used in Environmental Assessment screening guidance and adopted as the Department of Toxic Substances Control's acceptable level of risk. As noted above, removal actions currently undertaken by the District are based upon these screening evaluations. The District considers

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

that the "no significant risk levels" established by the State are relevant and appropriate and should be considered when refined assessment activities are conducted.

**Response**

Acceptable or target risk levels are in the risk management domain. The guidelines cover risk assessment and exclude risk management.

**Comment**

Please note that the District considers all relevant and appropriate exposures to assess risk for its existing school occupancies. As such, the District has developed a guidance document and associated Excel spreadsheet to quantify school-based risk. The methodology is based upon the above referenced technical support document (OEHHA, 2000) with exposure parameters assigned by occupancy (e.g., kindergarten through the 6 grade). The District believes it is consistent with OEHHA's existing assessment methodology. The program's format allows for quick data entry and is robust in its computational ability to quantify risk for a suite of identified compounds. The guidance document is included for your review and consideration. Staff is currently finalizing the Excel spreadsheet for distribution and will forward an electronic copy for your review the week of February 3rd.

**Response**

OEHHA has received and reviewed LAUSD's guidelines.

Lee Shull and Mark Bowland, Montgomery Watson Harza (MWH)

**General Comment**

As a follow up to recent discussions, this letter presents MWH's review comments on OEHHA's draft (File date 10/3/02, header date August 20, 2002) Schools Risk Screen Model (Model). The Model we reviewed was provided by OEHHA to Mr. Ernest Silva of the Coalition for Adequate School Housing (CASH). Our review has been performed on behalf of CASH. Both CASH and MWH greatly appreciate the opportunity to review the Model and provide these comments, and look forward to assisting OEHHA however we can as the agency continues its development of the schools program. Whereas this letter provides substantively technical comments, we will provide our comments on the Model as it relates to policy and implementation issues in a separate letter.

For practical purposes, we have organized our comments on the Model and the associated guidance document into four basic areas: (1) identification of potentially fatal flaws/errors/omissions in the Model, (2) critical flaws/errors/omissions in the Model, (3) suggested user interface improvements, and (4) general/editorial comments.

**Comment**

1. Input-output sheet. Results include a "0-18 + staff" endpoint. This endpoint assumes that a child spends the entirety of his/her education (preschool through high school) at a single campus, and then post college teaches an entire career at the same campus. This

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essentially assumes 43-year exposure duration (ED), which is greater than the current residential default assumption. We believe this endpoint is an unreasonable point of departure for decision making. We encourage OEHHA to develop a more reasonable ED value for inclusion in the model.

**Response**

Which years are aggregated is a case-specific, user/reviewer decision. We have removed the cells labeled "0-18 + staff" to avoid the implication that any particular exposure duration is "approved" by OEHHA.

**Comment**

2. Groundwater and soil vapor input cell. If a value of "0" is placed in both the groundwater and soil vapor concentration input cells, calculation errors (#value!) Prevent production of useful risk or hazard values.

**Response**

This error has been corrected.

**Comment**

3. *J&E model database*. If a chemical that is not part of the J&E model database is selected, calculation errors occur due to J&E malfunction. Documentation instructs the user to add the chemical to the database, but gives no procedure for performing this function (the sheet is password protected).

Additionally, no guidance is given to direct the user when it is essential to add a volatile chemical to the database, or what data must be entered into all the relevant "vlookups" sheets for all three J&E model components (i.e., soil, soil gas, groundwater). Additional text should be added to the model documentation and model spreadsheets outlining the procedures necessary for adding these features. Also, we suggest a single "vlookups" sheet for all three model components to reduce the potential for user entry error.

**Response**

The duplicate "vlookup" and "chemprops" sheets have been eliminated, so that the relevant information needs to be added in only one place. Guidance has been added as to when and how to add chemicals to the database.

**Comment**

4. *Route-to-route extrapolation*. In cases where route-to-route extrapolation is rejected in Input-Output (cells B 13 and/or B 18 given values of "0"), all exposure sheets do not reference the user supplied RfD or CSF values for soil direct contact.

**Response**

This error has been corrected.

**Comment**

5. *Input-Output Sheet*. If a user allows the model to perform route-to-route extrapolation of oral and dermal toxicity criteria from inhalation toxicity criteria, the model may use an

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

inappropriate toxicity metric for the oral and dermal pathways. For example, the inhalation cancer slope factor for 1,4-dichlorobenzene is  $4 \times 10^{-2}$ . The oral cancer slope factor is  $5.4 \times 10^{-3}$ , or 7 times lower. Similarly, the inhalation cancer slope factor for 1,3-butadiene is 0.6, whereas the oral cancer slope factor is 3.4, or six times higher. An additional issue with this procedure is the implication that use of inhalation toxicity factors as surrogates for oral and dermal exposures is appropriate. For numerous inorganic chemicals (nickel, chromium 6+, cadmium) this implication has potentially enormous ramifications, as these inorganics are not currently considered carcinogens by the oral routes. We suggest adding a toxicity criteria table containing both oral/dermal and inhalation toxicity criteria, or defaulting to a user input toxicity criteria for each route and for each chemical for the oral and dermal pathways.

**Response**

The intent is not to automatically default to inter-route extrapolation. In order to make this intent clearer, the spreadsheet now uses an exclusive user-supplied CPF and RfD as an alternative when these parameters are not in the database. The reviewer should ensure that the assessor documents any user-supplied CPFs or RfDs.

**Comment**

6. Input-Output Sheet. Results for cancer risk for scenario 0-4 sums 0-5 results, 5-10 scenarios sums 0-6 results, not 5-10 results.

**Response**

The error for 5-10 year olds has been corrected. The sum for ages 0-4 should include 4-5, since these are four-year-olds.

**Comment**

7. *Volatilization assumption* It is doubtful that DDT (and similar semi-volatile compounds) would actually volatilize in appreciable concentrations. It is our opinion that semi-volatiles such as DDT should not be modeled to indoor air.

**Response**

We agree that DDT and similar semi-volatile compounds will not volatilize in appreciable concentrations, because of the low volatility of these compounds. For example, the indoor air pathway contributes 0.04 percent of total risk for DDT.

**Comment**

8. *Fate*. Cell C22 contains a reference error that prevents a breast milk pathway calculation.

**Response**

This error has been corrected.

**Comment**

9. *Input-Output sheet + Fate*. Units for chemical concentration in PM10 are different between these sheets (ug/L versus ug/g).

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**Response**

This error has been corrected.

**Comment**

10. *Fate*. Toggles don't function when a chemical is not in the database (e.g., metals) because an error message is created. Logic equations rather than simple arithmetic equations would prevent this from occurring. Also, see comment #3.

**Response**

I was unable to replicate the problem

**Comment**

11. *Fraction at school is used to partition daily soil ingestion*. Guidance documents indicate that this fraction should also be incorporated into dermal dose calculations as indicated by the equation on page 4 of the guidance document. We agree with this conclusion. However, this fraction appears only to be included in the age 3-4 exposure spreadsheet and in none of the other dermal dose calculations.

**Response**

This error has been corrected.

**Comment**

12. *Dermal exposure assessment*. The approach for dermal exposure assessment represents a departure from current OEHHA, DTSC, and USEPA dermal assessment protocols. Additional discussion highlighting the need/utility of this new protocol should be included in the guidance document.

**Response**

The selected approach is recommended by EPA, and is based on data relevant to the school scenario. The Guidance discusses the salient arguments for selection of this approach.

**Comment**

13. *Fate*. Cell H7. The on-site soil-to-indoor dust Transfer Coefficient (dermal) does not appear to be used in the calculation.

**Response**

This error has been corrected.

**Comment**

14. *Indoor air modeling*. Default indoor air modeling is based on Johnson and Ettinger model parameters for residential homes, which clearly do not apply to schools. The model and model documentation do not provide adequate guidance on what model parameters may be modified or how such modifications may be incorporated. We suggest, for screening, applying conservative but non-residential parameters.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Response**

OEHHA proposes a default air exchange rate of 4.9 per hour, the lower confidence limit on the weighted mean value from 94 portable and 26 traditional classrooms (RTI, 2003). This and other parameters may be changed from default values when justified and documented.

**Comment**

*15. Age-specific exposure sheets. Soil Ingestion. P. 11.* Of the OEHHA school model guidance document cites OEHHA (2000) guidance for soil ingestion. OEHHA (2000) recommends 200 mg/day soil ingestion for children age 1-6 and 100 mg/day for "everyone else." This approach is inconsistent with the available data, which indicate adults, and especially adults in non-soil intensive exposure work environments, do not consume 100 mg/day. This approach is also inconsistent with other Cal/EPA guidance for worker soil and dust exposures, and is also inconsistent with USEPA's recommended 50 mg/day for adults.

**Response**

The soil ingestion rate in question (100 mg/day) is partitioned such that only 58 percent of that amount (58 mg/day) is assumed to occur at school. Since most estimates of occupational exposure consider only the fraction of total exposure that occurs in the occupational setting, the assumptions are not far apart (50 mg/day versus 58 mg/day).

**Comment**

*16. Potential users of the spreadsheet.* It is critical that OEHHA state that the spreadsheet and guidance document are "expert tools" and not intended to be layperson tools.

**Response**

The following sentence has been added on page 8: "This guidance assumes that the user is familiar with the principles of chemical risk assessment; it is not intended to provide basic instruction in risk assessment."

**Comment**

*17. Dust exposure.* The utility of differentiating indoor dust from outdoor dust in the model is uncertain. Most schools will go through the assessment process prior to construction and performing any measurement of chemical concentrations in indoor dust. Separating soil ingestion, dermal and inhalation pathways in this fashion may lead to more confusion than clarity.

**Response**

Recent field studies have demonstrated a concentrating effect for several elements in indoor dust compared to school-yard soil (RTI, 2003). OEHHA is now recommending a default value of 2 for the soil/dust transfer factor (see page 17).

**Comment**

*18. Toxicologic endpoints.* No discussion or delineation in the model/model documentation is presented that addresses assessment of specific toxicologic endpoints (also referred to as target organ toxicity). This is an important subject and should be explicitly addressed in the guidance, and where possible, in the model itself.

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**Response**

The additivity of hazard quotients for different chemicals based on their target organ and/or mode of action is discussed on page 9: "If the total hazard index does not exceed one, then it may be assumed that the non-cancer toxic effects are unlikely and further analysis of non-cancer effects is not necessary. If the total hazard index exceeds one, it may be useful to separate chemicals by target organ and/or mode of action and add the hazard quotients of only those chemicals that are likely to act in an additive manner. This target organ/mode of action analysis should be documented." Similar language is in the sheet "user's guide." Chemical-specific information on additivity is available elsewhere.

**Comment**

*19. Stakeholder involvement in Model development.* No indication is provided in the guidance documents that stakeholders have been included in the development of key exposure parameters such as exposure time and exposure frequency. This lack of involvement increases uncertainty as to whether the values used in the model for these parameters are representative of California school conditions. CASH is in a unique position to provide data specific to public schools for these parameters.

**Response**

The opportunity for stakeholder involvement was open through May 2003. All recommendations for parameter values that were supported by documentation were considered.

**Comment**

*20. Annual risk estimations.* The assessment of theoretical upper-bound cancer risk and non-cancer hazard indices on a year-by-year basis is a new risk assessment approach. Hopefully, OEHHA has carefully considered the propriety of this approach. We assume that this approach is used in consideration of the new age-specific toxicity criteria (OEHHA, 2002 draft, p.11) under development by OEHHA. Until these criteria are developed, we are uncertain of this approach.

**Response**

The language in HSC Section 901 suggests that the legislators were concerned that typical risk assessment paradigms (which use longer-term average exposure rates) fail to consider the specific exposures and sensitivities of children. OEHHA took this as a mandate to look specifically at the exposure parameters of young children. To do this effectively required using age-specific exposure parameters. As noted in the comment, this approach is also anticipates development of age-specific toxicity criteria by OEHHA.

**Comment**

*21 Consistency with other OEHHA guidance.* The model incorporates assumptions that vary from other currently available OEHHA risk assessment guidance (OEHHA, 2000) without defining the need for the variation. Variations from published agency guidance should be discussed including rationale as to why OEHHA believes the approach/assumptions in the model is more applicable to the schools risk assessments.

**Response**

Though it is not further described in the comment letter, we assume that "(OEHHA, 2000)"

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

refers to the “Technical Support Document for Exposure Assessment and Stochastic Analysis” (TSD). The TSD was created for a different purpose than the Schools Guidance, and the differences in mission and mandate require some differences between the two. For example, the Schools Guidance must include “Appropriate child-specific routes of exposure unique to the school environment in addition to those in existing exposure assessment models.” This requires a different approach, focusing on the rapidly changing exposure patterns of young children and the unique features of the school environment as they affect exposures. Because children are rapidly changing anatomically, physiologically and behaviorally, we recommend a set of exposure parameters for each year until age 18. In contrast, the TSD presents methodology for estimating long-term average exposures in a 24-hour-per-day exposure setting. Nonetheless, internal consistency to the extent possible was a consideration in developing this guidance. Exposure parameters are discussed below in the context of internal consistency.

The proposed value for *Soil Ingestion*, 200 mg/day is the value recommended in the TSD, and is equivalent to EPA’s “conservative estimate of the mean.

**Fraction at school:** There is no equivalent parameter in the TSD.

**Body-part-specific skin loading rate** and **body-part-specific skin surface area** differ from the methods and parameters recommended in the TSD. These methods and parameters are from EPA (2002) guidance which antedates the TSD. OEHHHA considers these data to be the best available for the **Guidance** because they are based on real-world exposures to young children in day-care centers, an exposure setting similar to the School setting addressed in the **Guidance**.

**Fraction outdoors** and **Fraction indoors** also have no equivalent parameter in the TSD. However, these parameter values are based on time-activity studies reported in the TSD.

**Body weight** data for children 1 to 18 years are from OEHHHA, 2000, Table 10.3. For pregnant or nursing women, and for staff the data are from OEHHHA, 2000, Table 10.1. The value for children up to 1 year old is from EPA, 2002, because there is no equivalent value in the TSD (OEHHHA, 2000).

**Exposure time, outdoors** and **Exposure time, indoors:** Although OEHHHA (2000) considered activity-related breathing rates and time spent at those activities, the focus was to develop an amalgamated breathing rate over time. The **Guidance** differs in that it considers indoor and outdoor breathing rates separately, since these environments may have different contaminant loadings. Again, OEHHHA believes that this approach is consistent with the legislative mandate.

**Breathing rate, outdoors** and **Breathing rate, indoors** were estimated from the data of Wiley, et al in OEHHHA, 2000, pp. 3-25 to 3-27. These ventilation rates are based on the activity descriptors in the Wiley, et al. report, that were deemed consistent with outdoor and indoor activities at school, respectively.

**Exposure frequency**, the estimated number of days students or other school users attend school annually is based on California DHS and ARB survey data. There is no equivalent parameter in the TSD.

The recommended **Breast milk intake** of 130 g/kg/day for the first 12 months of life is based on (OEHHHA, 2000, Table 5.13, 90th percentile).

**Lifetime Exposure Fraction (ED/AT)** The TSD recommends an exposure duration of 70 years (ED/AT = 1). This is not relevant for a schools exposure scenario.

**Fraction absorbed, inhalation** and **Fraction absorbed, ingestion** are not found in the TSD. The **Guidance** does not at present suggest values other than unity. Indeed, some commentators have suggested that a factor with a value of one is pointless, and should be omitted. HSC Section 901 requires consideration of uncertainty in the model. To omit these absorption fractions would be to ignore a source of uncertainty.

**Fraction absorbed, dermal:** In order to maximize consistency with the TSD, OEHHHA now recommends the following dermal absorption fractions:

Compound	Absorption fraction	Source
Arsenic	0.04	OEHHHA, 2000
Beryllium	0.01	OEHHHA, 2000
Cadmium	0.001	OEHHHA, 2000
Hexavalent chromium	0.01	OEHHHA, 2000
Lead	0.01	OEHHHA, 2000
Mercury	0.1	OEHHHA, 2000
Nickel	0.04	OEHHHA, 2000
Polychlorinated biphenyls	0.14	OEHHHA, 2000
Polychlorinated dibenzo-p-dioxins and dibenzofurans	0.02	OEHHHA, 2000
Hexachlorocyclohexanes	0.1	OEHHHA, 2000
Polynuclear aromatic hydrocarbons,	0.13	OEHHHA, 2000
DEHP	0.1	OEHHHA, 2000
4,4' methylene dianiline	0.1	OEHHHA, 2000
Organophosphates, pentachlorophenol	0.25	DTSC, 1994
Chlorinated insecticides	0.05	DTSC, 1994
Other organic chemicals	0.1	DTSC, 1994
Other metals and complexed cyanides	0.01	DTSC, 1994
Free cyanide	0.1	DTSC, 1994

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Comment**

22. *Acceptable risk.* No indicators in the guidance or in the model are provided as to what metrics OEHHA is applying for judging what is an "acceptable risk."

**Response**

Acceptable or target risk levels are in the risk management domain. The guidelines cover risk assessment and not risk management.

**Comment**

23. *Model parameters.* All model parameters that can be changed should be clearly and plainly listed on the input-output sheet. This would include all pathway toggles, dermal, oral, and inhalation absorption parameters, chemical properties, exposure frequency, etc.

**Response**

Use of the model in screening mode with all defaults involves entering data only in the shaded cells in "Input-output" column B. Changing values outside that range will move the user into tier 2 and will require justification of all proposed changes from the default condition.

**Comment**

24. *Input-Output Sheet.* For hazard results, no indication is provided as to which hazard estimate to use. We suggest a "=max (range)" formula be inserted for each scenario.

**Response**

This suggestion has been adopted. See Input-output cell H25.

**Comment**

25. *Equations.* We suggest locking cells containing equations that should not be modified.

**Response**

Sheets other than "Input-output" will be locked when the spreadsheet is released, to prevent inadvertent changes to formulas and parameter values. However, reviewers should still verify the calculations against their own (unmodified) copy of the workbook.

**Comment**

26. *Chemical properties.* We suggest adding chemical property input cells on Input Output sheets that are activated only when a chemical is not in the database.

**Response**

Chemical properties can be entered in the "Vlookup" sheet.

**Comment**

27. *Input-Output Sheet.* Currently no dermal absorption fractions are defined in the "database", but are presented in the guidance document. We suggest adding a table of values from the guidance into the model. See comment #21 above.

A2-25

**Response**

This has been done.

**Comment**

28. *Fate sheet. Q/C* value based on 10-acre site for LA. Meteorological conditions are different for Northern and Southern California. We suggest a table containing a range of *Q/C* values, with a toggle to allow the user to define what region of California in which the site is located.

**Response**

Regional *Q/Cm* ratios would make a minor change in a minor pathway. It is not clear that the added complexity brings commensurate benefit.

**Comment**

29. *Age-specific exposure sheets.* Dividing soil ingestion rate by body weight to create a soil ingestion per kilogram body weight rate implies that soil ingestion is directly correlated with body weight, which is not consistent with the exposure equations listed in the guidance document. These two parameters are not directly correlated.

**Response**

Cell H18 is now changed to g/day, then divided by body weight in the "contact rate" cell, in order to avoid the appearance that soil ingestion and body weight are treated as correlated.

**Comment**

30. *I&E Model parameters.* We suggest including pertinent Johnson & Ettinger model parameters in the Input-Output sheet.

**Response**

This will be considered for future spreadsheet enhancements.

**Comment**

31. *Grammatical errors.* Numerous spelling and grammatical errors exist throughout the model spreadsheets, and associated documentation.

**Response**

We will correct these as we identify them.

**Comment**

32. *Fate.* Breast milk BCF reference should be University of California (1994), not DTSC (1994).

**Response**

This has been corrected.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Comment**

33. *Fate + individual age range calculation spreadsheets.* We suggest adding additional clarification for each pathway delineated by a number. When printed, there is no indication which pathway is soil ingestion or dermal contact (1 vs. 2 vs. 3).

**Response**

Widening column 1 to accommodate the pathway name would make the sheet will be too wide to display on a single screen and would duplicate information in column B (exposure medium) and column E (exposure route).

**Comment**

34. *Units.* Input output sheet does not specify units for user defined CSF or RfD.

**Response**

This has been corrected.

**Comment**

35. *Fate sheet.* Units of M8 & M9 should be µg/L.

**Response**

This has been corrected.

**Comment**

36. *Age-specific intake spreadsheets.* The water intake parameter is not used in any calculations.

**Response**

This has been eliminated

**Comment**

37. *Guidance document, p.10. Outdoor air PM10 levels.* The document states OEHHA recommends 1.8E-9, but the spreadsheet uses 5.0E-8.

**Response**

This has been corrected.

**REFERENCES (Cited in the responses)**

1. RTI, 2003, Final Report, OEHHA Soil Sampling Augmentation, RTI International Project #RTI/08381-01F, April 2003
2. OEHHA, 2000 Technical Support Document for Exposure Assessment and Stochastic Analysis, Air Toxics Hot Spots Program Risk Assessment Guidelines Part IV, September, 2000

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**COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD**

November 7, 2003 - December 8, 2003

Deborah Oudiz, Department of Toxic Substances Control (DTSC)

**Comment**

1. The title is too restrictive. Please drop "existing and proposed" from the title.

**Response**

The title of the document comes directly from the enabling legislation. OEHHA staff feel that removing the word "Proposed" from the title actually restricts the sites where this guidance should be used, while inclusion of the word covers those sites intended by the legislation. Therefore, OEHHA deems it appropriate that the title of the document be a direct reflection of the language in the statute: "...the office shall publish a guidance document, for use by the Department of Toxic Substances Control and other state and local environmental and public health agencies, to assess exposures and health risks at existing and proposed schoolsites."

Melanie Marty, Office of Environmental Health Hazard Assessments (OEHA)

**Comment**

1. Please add text discussing the possibility of future age-specific cancer potency.

**Response**

Text discussing the possibility of future age-specific cancer potency has been added (see page33).

**Comment**

2. Please add text discussing about population risk

**Response**

Two sentences discussing population risk have been added (see page 24).

**Comment**

3. Please change the exposure duration for staff to 40 years to be consistent with other OEHHA guidance.

**Response**

The exposure duration for staff has been changed to 40 years (see pages 24 and 25).

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Bill Piazza, Los Angeles Unified School District

**Comment**

The timeline specified for public comment is inadequate. The District is cognizant of OEHHHA's reliance on the requirements set forth in Health and Safety Code Section 57003 for receiving public comment. However, nothing in the statute precludes OBHHA from extending the timeline to ensure that the proposed guidelines are "based upon sound scientific methods, knowledge and practice." In fact, the statute does not limit the public comment period to 30 days but specifically states that following the public workshop the proposed guidance shall be circulated "for a period of at least 30 days." The District believes its request to extend the public comment period is appropriate and underscored by the extent of time OEHHHA has taken to amend and respond to initial comments on the original draft guidance. The District did not receive a copy of the revised guidance nor its response to comments until November 7, 2003. This is more than 280 days from our initial comment submittal of January 31, 2003. Notwithstanding, the District is aware that time is required to review and respond to both peer and public comments, as well as revise the draft guidance, as appropriate. In fact, OEHHHA commissioned additional classroom studies, one of which was designed to determine the contaminant composition of interior surface dust (i.e., dust mat and classroom floor dust) to outdoor soil concentrations. Although the District is supportive of this effort, this data is new information which was not previously available for public scrutiny. Clearly, additional time is required to address the adequacy of this study and exposure potential of indoor contaminants to a given school occupancy.

**Response**

Three substantive changes were introduced in the current draft of the Guidance: Minor changes to the default school calendar, inclusion of an outdoor/indoor transfer factor, and revised default outdoor/indoor air exchange, all based on the RTI, 2003 report. The relevant section of the RTI report (Attachment 1) is 2 pages long. Thirty days appears to be adequate time to review and comment on the report and the interpretation thereof.

**Comment**

This is most relevant as OEHHHA relies upon the study's findings to recommend a default soil to indoor dust transfer factor of two (2). This assumption is significant and may drive the risk estimate for a given occupancy. The District believes this default assumption is problematic. One major flaw is that OEHHHA assumes "day care centers" are representative of student exposures in the first through the twelfth grade. To the contrary, the study relied upon by OEHHHA collected indoor dust from floor surfaces. It is unlikely that students at these grade levels will sit, play, and crawl on the floors for the preponderance of their tenure at school. This is relevant as it is reported in the Report to the California Legislature, Environmental Health Conditions in California's Portable Classrooms (ARB, DHS, June 2003) that floor dust contaminants are "especially a concern for young children who spend time on the floor and can be exposed to the dust contaminants by hand-to-mouth contact and skin contact." The District agrees that special consideration be given to this sensitive occupancy, however, we believe most older students generally walk into their classrooms and sit at desks or a similar work surface, thereby eliminating a direct exposure pathway to surface floor dust. Please note, the OEHHHA commissioned study did not identify dust loadings or contaminant concentrations at task level (e.g., desk and related working surfaces) where direct contact is likely to occur. Nor did the study provide any information to assess the reentrainment potential of floor dust

A2-29

which may contribute to task level loadings and exposures through the inhalation pathway. District staff is cognizant of the U.S. Environmental Protection Agency's (U.S. EPA) guidance to assess the reentrainment potential of road surface dust from the movement of vehicular sources along a roadway segment. We are unaware of similar guidance associated with the inhalation of resuspended floor dust from a student walking across a classroom floor.

**Response**

OEHHHA made no assumption that "day care centers" are representative of student exposures in the first through the twelfth grade. On the contrary, exposure parameters change year by year, with the exposure parameters for high school students closely resembling those for adults.

OEHHHA acknowledges that the concentration of contaminants in dust vacuumed from the floor may be different from that in dust on table-tops and window sills and other surfaces, and that more data on these potential exposure media would be desirable. Nonetheless, the multiple sources of interior dust are essentially the same (though possibly in different proportions) whether the dust is suspended in the air as particulate matter, or collected from table-tops, window sills, or floors. If a site is to be assessed prior to construction of a school, some assumption must be made about the concentration of contaminants in indoor dust on various surfaces. The comment does not include a suggested alternative value. OEHHHA believes that the existing data on the concentration of contaminants in floor dust relative to the concentration in outdoor soil provide the best currently available estimate of concentration of contaminants in all interior dust relative to the concentration in outdoor soil.

**Comment**

To evaluate the adequacy of the dose algorithms utilized in the draft guidance, District staff prepared a comparative analysis of values predicted utilizing identified equations consistent with U.S. EPA's Risk Assessment Guidance for Superfund (RAGS). According to OEHHHA's response to concerns raised regarding the discrepancy between the proposed exposure equations and the "standard form given in the U.S. EPA RAGS" guidance, it was reported that although "some minor aspects may differ, the general form of the equations is consistent with U.S. EPA RAGS." To that end, the values predicted by either approach should be consistent. With all exposure variates being equal, the District was unable to predict similar values for several exposure pathways. In fact, the District's annual average daily dose values were as much as two to three orders of magnitude more 'conservative (i.e., health protective) than those identified with the OEHHHA predictive model. Due to the limited time to address this discrepancy, the District requests clarification and validation of the proposed exposure equations relative to the established format identified in regulatory guidance.

**Response**

The general form of the equations is consistent with U.S. EPA RAGS. This does not mean that the input values or the actual output results are the same as in RAGS. Indeed, if they were, there would be no reason to have schools risk assessment guidance. The equations and inputs referred to in the comment are from EPA's Children's Exposure Factors Handbook. "Validation" in this context usually refers to field testing of theoretical equations to describe nature. In this case, the algorithms are based on field measurements. EPA apparently felt that they were sufficiently "valid" to adopt in their guidance.

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## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### Comment

In addition to the lack of reproducibility of several dose values, OEHHA's report of only "minor" changes to other exposure pathway equations (e.g., inhalation of contaminants in vapors that originate off site) may arbitrarily bias the predicted annual average daily dose. For example, by scaling the breathing rate for the time spent in school (e.g., 540 minutes per day), the modeled concentration must coincide with the identified school-based exposure. This is not standard practice and would require post-processing of the model output to generate the appropriate value. Existing guidance would simply utilize the model scalar option to predict the annual average exposures for a given time period (i.e., ending hours 8 through 16) averaged over the number of hours specified in the meteorological data set (i.e., 8760 hours). As such, the dose algorithm would simply require a daily breathing rate value. In anticipation of OEHHA's concern that there are differences in indoor versus outdoor breathing rates that would preclude the use of a daily breathing rate, the District believes that reasonable assumptions can be made to approximate an enhanced rate which accounts for variable light, moderate and heavy activity levels representative of a public school setting. This approach is discussed in OEHHA's discussion characterizing the proposed ventilation rates for the proposed guidance. In addition, OEHHA's Technical Support Document for Exposure Assessment and Stochastic Analysis provides a detailed discussion on ventilation rates and related distribution profiles to assist in developing high end estimates that reflect daily activity patterns associated with student and staff exposures. Notwithstanding, the proposed guidelines should either be revised to reflect the form and format of the exposure pathway equations that reflect existing regulatory guidance and practice or direct the user to make the appropriate adjustments to the dispersion model output.

### Response

Changes have been made to the Guidance to direct the user to make the appropriate adjustments to the dispersion model output (see pages 10 and 11).

### Comment

Please note, there are additional issues which require further consideration. However, due to the time allotted for public comment, the District is limited to its current discourse. However, the District trusts that its concerns will be addressed to allow for continued discussion and comment on the proposed guidelines. In its current form, the District has reservations about the adequacy of the proposed guidance. I can be reached at (213) 241-3926 should you have any questions or need additional information.

### Response

No response

### RULE 9510 INDIRECT SOURCE REVIEW (ISR) (Adopted December 15, 2005)

#### 1.0 Purpose

The purposes of this rule are to:

- 1.1 Fulfill the District's emission reduction commitments in the PM10 and Ozone Attainment Plans.
- 1.2 Achieve emission reductions from the construction and use of development projects through design features and on-site measures.
- 1.3 Provide a mechanism for reducing emissions from the construction of and use of development projects through off-site measures.

#### 2.0 Applicability

- 2.1 This rule shall apply to any applicant that seeks to gain a final discretionary approval for a development project, or any portion thereof, which upon full build-out will include any one of the following:

- 2.1.1 50 residential units;
- 2.1.2 2,000 square feet of commercial space;
- 2.1.3 25,000 square feet of light industrial space;
- 2.1.4 100,000 square feet of heavy industrial space;
- 2.1.5 20,000 square feet of medical office space;
- 2.1.6 39,000 square feet of general office space;
- 2.1.7 9,000 square feet of educational space;
- 2.1.8 10,000 square feet of government space;
- 2.1.9 20,000 square feet of recreational space; or
- 2.1.10 9,000 square feet of space not identified above.

- 2.2 This rule shall apply to any transportation or transit project where construction exhaust emissions equal or exceed two (2.0) tons of NOx or two (2.0) tons of PM10.

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SJVUAPCD

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12/15/05

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

- 2.3 Projects on Contiguous or Adjacent Property
- 2.3.1 Residential projects with contiguous or adjacent property under common ownership of a single entity in whole or in part, that is designated and zoned for the same development density and land use, regardless of the number of tract maps, and has the capability to accommodate more than fifty (50) residential units are subject to this rule.
- 2.3.2 Nonresidential projects with contiguous or adjacent property under common ownership of a single entity in whole or in part, that is designated and zoned for the same development density and land use, and has the capability to accommodate development projects emitting more than two (2.0) tons per year of operational NOx or PM10 are subject to this rule. Single parcels where the individual building pads are to be developed in phases must base emissions on the potential development of all pads when determining the applicability of this rule.
- 3.0 Definitions
- 3.1 APCO: as defined in Rule 1020 (Definitions).
- 3.2 APCO-Approved Model: any computer model that estimates construction, area source and/or operational emissions of NOx and PM10 from potential land uses, using the most recent approved version of relevant ARB emissions models and emission factors, and has been approved by the APCO and EPA.
- 3.3 Air Impact Assessment (AIA): the calculation of emissions generated by the project and the emission reductions required by the provisions set forth in this rule. The AIA must be based solely on the information provided to the APCO in the AIA application, and must include all information listed in Section 5.6, et seq.
- 3.4 Air Impact Assessment (AIA) Application: the aggregate of documentation supporting the development of an AIA. This includes, but is not limited to, the information listed in Section 5.0, et seq.
- 3.5 Air Resources Board (ARB or CARB): as defined in Rule 1020 (Definitions).
- 3.6 Applicant: any person or entity that undertakes a development project.
- 3.7 Area Source: any multiple non-mobile emissions sources such as water heaters, gas furnaces, fireplaces, wood stoves, landscape equipment, architectural coatings, consumer product, etc., that are individually small but can be significant when combined in large numbers.
- 3.8 Baseline Emissions: the unmitigated NOx or PM10 emissions as calculated by the APCO-approved model.
- 3.9 Construction: any excavation, grading, demolition, vehicle travel on paved or unpaved surfaces, or vehicle exhaust that occurs for the sole purpose of building a development project.
- 3.10 Construction Baseline: the sum of baseline NOx or exhaust PM10 for the duration of construction activities for a project or any phase thereof, in total tons.
- 3.11 Construction Emissions: any NOx or exhaust PM10 emissions resulting from the use of internal combustion engines related to construction activity, which is under the control of the applicant through either ownership, rental, lease agreements, or contract.
- 3.12 Contiguous or Adjacent Property: a property consisting of two or more parcels of land with a common point or boundary, or separated solely by a public roadway or other public right-of-way.
- 3.13 Development Project: any project, or portion thereof, that is subject to a discretionary approval by a public agency, and will ultimately result in the construction of a new building, facility, or structure, or reconstruction of a building, facility, or structure for the purpose of increasing capacity or activity.
- 3.14 Discretionary Approval: a decision by a public agency that requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular development project, as distinguished from situations where the public agency merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations.
- 3.15 District: the San Joaquin Valley Unified Air Pollution Control District as defined in Rule 1020 (Definitions).
- 3.16 Emission Reduction Measure: an activity taken or conditions incorporated in a project to avoid, minimize, reduce, eliminate, or compensate emissions estimated to occur from new development projects.
- 3.16.1 On-Site Emission Reduction Measure: any feature activity, device, or control technology of a project, which is incorporated into the design of that project or through other means, which will avoid, minimize, reduce or eliminate the project's emissions. All on-site emission reductions achieved beyond District or state requirements shall count towards the mitigated baseline. City, County and other public agency requirements may also be credited towards emission reductions.
- 3.16.2 Off-Site Emission Reduction Measure: any feature, activity, or emission reduction project used, undertaken, or funded to compensate for a project's emission that is not part of the development project.

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- 3.17 Indirect Source: any facility, building, structure, or installation, or combination thereof, which attracts or generates mobile source activity that results in emissions of any pollutant, or precursor thereof, for which there is a state ambient standard, as specified in Section 1.1.
- 3.18 Land Use: any facility, building, structure, installation, activity, or combination thereof, and the purpose, for which it is arranged, designed, intended, constructed, erected, moved, altered or enlarged on, or for which it is or may be occupied or maintained. Land use can be identified in the following categories:
- 3.18.1 Commercial: any facility, building, structure, installation, activity or combination thereof, that offers goods and services for sale. This can include but is not limited to wholesale and retail stores, food establishments, hotels or motels, and movie theatres.
- 3.18.2 Educational: any facility, building, structure, installation, activity or combination thereof, whose purpose is to develop knowledge, skill, and character. This can include but is not limited to: schools, day care centers, libraries, and churches.
- 3.18.3 General Office: any facility, building, structure, installation, activity or combination thereof, where the affairs of a non-medical business are conducted.
- 3.18.4 Governmental: any facility, building, structure, installation, activity or combination thereof, where the affairs of an entity that exercises authority over a country, or any subdivision thereof, are carried on.
- 3.18.5 Industrial: any facility, building, structure, installation, activity or combination thereof that creates, collects, extracts, packages, modifies, and/or distributes goods.
- 3.18.5.1 Light Industrial: Usually employs fewer than 500 persons, with an emphasis on activities other than manufacturing and typically have minimal office space. Typical light industrial activities include: print plants, material testing labs, and assemblers of data processing equipment. Light Industrial tends to be free-standing
- 3.18.5.2 Heavy Industrial: Also categorized as manufacturing facilities. Heavy Industrial usually has a high number of employees per industrial plant.

- 3.18.6 Medical Office: any facility, building, structure, installation, activity or combination thereof, where the affairs of a business related to the science and art of diagnosing, treating, and preventing diseases are carried on.
- 3.18.7 Recreational: any facility, building, structure, installation, activity or combination thereof, where individuals may relax or refresh the body or the mind. This can include but is not limited to: parks, fitness clubs, and golf courses.
- 3.18.8 Residential: any facility, building, structure, installation, activity or combination thereof, which provides a living space for an individual or group of individuals.
- 3.19 Mitigation: synonym of on-site emission reduction measure. For the purposes of this rule, mitigation is all on-site emission reductions achieved beyond District or state requirements. City, County and other public agency requirements may be counted as mitigation, and credited towards emission reductions for the mitigated baseline.
- 3.20 Mitigated Baseline: the NOx or PM10 emission generated by a project after on-site emission reduction measures have been applied.
- 3.21 Mobile Emissions: the NOx or PM10 emissions generated by motorized vehicles.
- 3.22 Monitoring and Reporting Schedule (MRS): a form listing on-site emission reduction measures committed to by the applicant that are not enforced by another public agency along with the implementation schedule and enforcement mechanism for each measure. The Construction Equipment Schedule constitutes a MRS for the construction phase of a development project. The format of the MRS shall be provided by the District. The format of the MRS shall be provided by the District.
- 3.23 NOx: any oxides of nitrogen.
- 3.24 Off-Site Emission Reduction Fee (Off-Site Fee): a fee to be paid by the applicant to the District for any emission reductions required by the rule that are not achieved through on-site emission reduction measures. Off-Site Fees shall only apply to off-site emission reductions required, and shall only be used for funding off-site emission reduction projects.
- 3.25 Off-Site Emission Reduction Fee Deferral Schedule (FDS): a payment schedule requested by the applicant and approved by the District for Off-Site Emission Reduction Fees that ensures contemporaneous off-site emission reductions for the development project. Fee payment shall be made prior to the issuance of a building permit. The District shall provide the FDS format.

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- 3.26 On-Site Emission Reduction Checklist (On-Site Checklist): the list provided by the District that identifies potential on-site emission reduction measures. Project applicants must identify those measures that will be implemented and those that will not. There is no minimum required to be selected for implementation.
- 3.27 Operational Baseline: the baseline NOx or PM10 emissions, including area source and mobile emissions, calculated by the APCO-approved model, for the first year of buildout for that project, or any phase thereof, in tons per year.
- 3.28 Operational Emissions: for the purposes of this rule, the combination of area and mobile emissions associated with an indirect source.
- 3.29 Phase: a defined portion on a map, of a development project.
- 3.30 PM10 (or PM-10): as defined in Rule 1020 (Definitions).
- 3.31 Public Agency: any federal, state, local, or special agency that exercises discretionary powers on development activities within the San Joaquin Valley Air Basin.
- 3.32 San Joaquin Valley Air Basin (SJVAB): as defined in Rule 1020 (Definitions).
- 3.33 Transit: any passenger transportation service, local, metropolitan or regional in scope, that is available to any person who pays a prescribed fare. Transportation by bus, rail, or other conveyance, either publicly or privately owned, which is provided to the public or specialty service on a regular or continuing basis. Also known as "mass transit," "mass transportation," or "public transportation."
- 3.34 Transportation Projects: any project whose sole purpose is to create a new paved surface that is used for the transportation of motor vehicles, or any structural support thereof. Examples of transportation projects include: streets, highways and any related ramps, freeways and any related ramps, and bridges. This does not include development projects where traffic surfaces are a portion of the project, but not the main land-use.
- 3.35 URBEMIS: a computer model that is owned and modified by the local air pollution control districts and air quality management districts in the State of California. URBEMIS estimates construction, area source and operational emissions of NOx and PM10 from potential land uses, using the most recent approved version of relevant ARB emissions models and emission factors and/or District-specific emission factors; and estimates emissions reductions. The model has the capacity for changes to defaults when new or project specific information is known.

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- 3.36 Vehicle Trip: a trip by a single vehicle regardless of the number of persons in the vehicle, which is one way starting at one point and ending at another. A 'round trip' is counted as two separate trips.

4.0 Exemptions

- 4.1 Transportation projects shall be exempt from the requirements in Sections 6.2 and 7.1.2.
- 4.2 Transit projects shall be exempt from the requirements in Sections 6.2 and 7.1.2.
- 4.3 Development projects that have a mitigated baseline below two (2.0) tons per year of NOx and two (2.0) tons per year of PM10 shall be exempt from the requirements in Sections 6.0 and 7.0.
- 4.4 The following shall be exempt from the requirements of this rule:
- 4.4.1 Reconstruction of any development project that is damaged or destroyed and is rebuilt to essentially the same use and intensity.
- 4.4.2 Transportation Projects that consist solely of:
- 4.4.2.1 A modification of existing roads subject to District Rule 8061 that is not intended to increase single occupancy vehicle capacity, or,
- 4.4.2.2 Transportation control measures included in a District air quality attainment plan.
- 4.4.3 A development project on a facility whose primary functions are subject to Rule 2201 (New and Modified Stationary Source Review Rule) or Rule 2010 (Permits Required), including but not limited to the following industries:
- 4.4.3.1 Aggregate Mining or Processing;
- 4.4.3.2 Almond Hulling, Canning Operations, Food Manufacturing, Grain Processing and Storage, Vegetable Oil Manufacturing, and Wineries;
- 4.4.3.3 Animal Food Manufacturing;
- 4.4.3.4 Confined Animal Facilities;
- 4.4.3.5 Coatings and Graphic Arts;
- 4.4.3.6 Cotton Ginning Facilities;

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- 4.4.3.7 Energy Production Plants;
- 4.4.3.8 Ethanol Manufacturing;
- 4.4.3.9 Gas Processing and Production, Oil Exploration, Production, Processing, and Refining;
- 4.4.3.10 Glass Plants;
- 4.4.3.11 Solid Waste Landfills;
- 4.4.3.12 Petroleum Product Transportation and Marketing Facilities.

5.0 Application Requirements

Any applicant subject to this rule shall submit an Air Impact Assessment (AIA) application no later than applying for a final discretionary approval with the public agency. An applicant for a project for which a discretionary approval is pending at the date of rule effectiveness, shall also submit an AIA application by 30 days after the rule effectiveness date. Nothing in this rule shall preclude an applicant from submitting an AIA application prior to filing an application for a final discretionary approval with the public agency. It is preferable for the applicant to submit an AIA application as early as possible in the process for that final discretionary approval. The AIA application shall be submitted on a form provided by the District and shall contain the following information:

- 5.1 Applicant name and address;
- 5.2 Detailed project description including, but not limited to:
  - 5.2.1 Site Size;
  - 5.2.2 Site Plans;
  - 5.2.3 Proposed Project Schedule;
  - 5.2.4 Associated Project;
  - 5.2.5 If residential, the number and type of dwelling units;
  - 5.2.6 If commercial, the type, square footage and loading facilities;
  - 5.2.7 If industrial, the type, estimated employment per shift, and loading facilities;
  - 5.2.8 Amount of off-street parking provided for non-residential projects;

- 5.3 On-site Emission Reduction Checklist (On-Site Checklist): The District shall provide an On-Site Checklist that includes quantifiable on-site measures that reduce operational NOx and/or PM10 emissions.

5.3.1 The applicant shall identify measures voluntarily selected and how those measures will be enforced. On-Site measures must be fully enforceable through permit conditions, development agreements, or other legally binding instrument entered into by the applicant and the public agency; or, if the measure is not a requirement by another public agency, by a MRS contract with the District. Enforcement mechanisms can include:

5.3.1.1 Applicable local ordinance or section of a regulation that requires the measure, if any,

5.3.1.2 A District approved MRS, as identified in Section 5.4 below.

5.3.2 The applicant shall also include justification for those measures not selected.

5.3.3 All selected on-site measures, regardless of enforcement mechanism, shall count towards on-site emission reductions.

- 5.4 Monitoring and Reporting Schedule (MRS): The District shall provide a standardized MRS format. The applicant shall include in the AIA application a completed proposed MRS for on-site emission reduction measures selected that are not subject to other public agency enforcement, and the timeline for submittal of the construction equipment schedule. A proposed MRS shall outline how the measures will be implemented and enforced, and will include, at minimum, the following:

5.4.1 A list of on-site emission reduction measures included;

5.4.2 Standards for determining compliance, such as funding, record keeping, reporting, installation, and/or contracting;

5.4.3 A reporting schedule;

5.4.4 A monitoring schedule;

5.4.5 Identification of the responsible entity for implementation;

5.4.6 Provisions for failure to comply;

5.4.7 Applicants proposing on-site emission reduction measures that require ongoing funding, shall provide evidence in the proposed MRS of continued funding, including, but not limited to:

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- 5.4.7.1 Bonds; or
  - 5.4.7.2 Community Service Districts; or
  - 5.4.7.3 Contracts.
- 5.4.8 The schedule for submitting a construction equipment schedule.
- 5.5 Off-Site Fee Deferral Schedule (FDS): The District shall provide a standardized Fee Deferral Schedule form. An applicant may propose a FDS with the District if the total Off-Site Fee exceeds \$50,000. The payment schedule must provide assurance that reductions from off-site emission reduction projects can be obtained reasonably contemporaneous with emissions increases associated with the project and shall, at minimum, include the following:
  - 5.5.1 Identification of the person or entity responsible for payment;
  - 5.5.2 Billing address;
  - 5.5.3 Total required off-site operational emissions for the development project and any phase thereof;
  - 5.5.4 Total required off-site construction emissions for the development project and any phase thereof;
  - 5.5.5 Year of build-out, and any phase thereof;
  - 5.5.6 Any applicable milestones;
  - 5.5.7 Off-Site Fee down payment, to be not less than \$50,000;
  - 5.5.8 Payment schedule not to exceed or go beyond the issuance of a building permit. For development projects with multiple phases, the payment schedule shall connect fee deadlines for off-site emission reductions required by each phase prior to the issuance of building permits for those phases.
  - 5.5.9 The cost of reductions corresponding to the payment schedule;
  - 5.5.10 Applicable project termination and delay clauses; and
  - 5.5.11 Provisions for failure to comply.

- 5.6 Air Impact Assessment (AIA): An AIA shall be produced for the project from the project specific information identified in the AIA application. An AIA may be produced by or for the applicant. If an AIA is not provided by the applicant, the District shall perform the AIA during the AIA application review period. The AIA shall meet the following requirements:
  - 5.6.1 The analysis of the proposed project shall be conducted according to the information provided in the application;
  - 5.6.2 The analysis shall employ an APCO-approved model or calculator and include detailed documentation and reasons for all changes to the default input values;
  - 5.6.3 If the AIA is conducted by or for the applicant, a hard copy and an electronic copy of all model runs conducted for the project and each phase thereof, shall be submitted;
  - 5.6.4 The applicant shall include any other information and documentation that supports the calculation of emissions and emissions reductions;
  - 5.6.5 The AIA shall quantify construction and operational NOx and PM10 emissions associated with the project. This shall include the estimated construction and operational baseline emissions, and the mitigated emissions for each applicable pollutant for the development project, or each phase thereof;
  - 5.6.6 The AIA shall quantify the Off-Site Fee, if applicable.
- 6.0 General Mitigation Requirements
  - 6.1 Construction Equipment Emissions
    - 6.1.1 The exhaust emissions for construction equipment greater than fifty (50) horsepower used or associated with the development project shall be reduced by the following amounts from the statewide average as estimated by the ARB:
      - 6.1.1.1 20% of the total NOx emissions, and
      - 6.1.1.2 45% of the total PM10 exhaust emissions.
    - 6.1.2 An applicant may reduce construction emissions on-site by using less-polluting construction equipment, which can be achieved by utilizing add-on controls, cleaner fuels, or newer lower emitting equipment.

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6.2 Operational Emissions

6.2.1 NOx Emissions

Applicants shall reduce 33.3%, of the project's operational baseline NOx emissions over a period of ten years as quantified in the approved AIA as specified in Section 5.6.

6.2.2 PM10 Emissions

Applicants shall reduce of 50% of the project's operational baseline PM10 emissions over a period of ten years as quantified in the approved AIA as specified in Section 5.6.

6.3 The requirements listed in Sections 6.1 and 6.2 above can be met through any combination of on-site emission reduction measures or off-site fees.

7.0 Off-site Emission Reduction Fee (Off-Site Fee) Calculations and Fee Schedules

7.1 Off-site Fee Calculations

7.1.1 Construction Activities

7.1.1.1 NOx Emissions

The applicant shall pay to the District a monetary sum necessary to offset the required construction NOx emissions not reduced on-site. The off-site fee shall be calculated as follows:

$$CN\ OF = \sum_{i=1}^n [NACE_i - (0.8 \times NSEE_i)] \times CNR_i$$

Where,

CN OF = Construction NOx Off-Site Fee, in dollars

i = each phase

n = last phase

NACE = Actual Estimated Equipment NOx Emissions, as documented in the APCO approved Air Impact Assessment application, in total tons

NSEE = Statewide Average Equipment NOx Emissions, as calculated by the APCO, in total tons

CNR = Cost of NOx Reductions identified in Section 7.2.1 below, in dollars per ton. For projects with an approved FDS, the cost of reductions shall be based on the year each payment is made.

7.1.1.2 PM10 Emissions

The applicant shall pay a monetary sum necessary to offset the required construction PM10 exhaust emissions not reduced on-site. The off-site fee shall be calculated as follows:

$$CPM\ OF = \sum_{i=1}^n [PMACE_i - (0.55 \times PSEE_i)] \times CPR_i$$

Where,

CPM OF = Construction PM10 Off-Site Fee, in dollars

i = each phase

n = last phase

PMACE = Actual Estimated Equipment PM10 Emissions, as documented in the APCO approved AIA application, in total tons

PSEE = Statewide average Equipment PM10 Emissions, as calculated by the APCO, in total tons

CPR = Cost of PM10 Reductions identified in Section 7.2.2 below, in dollars per ton. For projects with an approved FDS, the fees shall be based on the year each payment is made.

7.1.2 Operational and Area Source Activities

7.1.2.1 NOx Emissions

The applicant shall pay a monetary sum necessary to offset the excess NOx emissions not reduced on-site. The off-site fee shall be calculated as follows:

$$NOxOF = \sum_{i=1}^n \left[ \left( \frac{NEB_i \times 7.5}{3} \right) - (NEB_i \times 7.5 \times NAPOR_i) \right] \times CNR_i$$

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Where,

NOx OF = Operational NOx Off-Site Fee, in dollars

i = each phase

n = last phase

NEB = Estimated Baseline Emissions, of Operational NOx, as documented in the APCO approved AIA application, in tons per year

NAPOR = NOx Actual Percent of On-Site Reductions, as documented in the APCO approved air impact assessment application, as a fraction of one, calculated as (NEB-NOx Mitigated Baseline)/NEB

CNR = Cost of NOx Reductions, identified in Section 7.2.1 below, in dollars per ton. For projects with an approved FDS, the cost of reductions shall be based on the year each payment is made.

7.1.2.2 PM10 Emissions

The applicant shall pay a monetary sum necessary to offset the excess PM10 emissions not reduced on-site for a period of ten years. The off-site fee shall be calculated as follows:

$$PM_{10} OF = \sum_{i=1}^n [(PMMB - 0.5 PEB_i)(10)] \times CPR_i$$

Where,

PM10 OF = Operational PM Off-Site Fee, in dollars

i = each phase

n = last phase

PEB = Estimated Baseline Emissions, of Operational PM10, as documented in the APCO approved AIA application, in tons per year

PMMB = Mitigated Baseline Emissions, as documented in the APCO approved AIA application, in tons per year

CPR = Cost of PM10 Reductions, identified in Section 7.2.2 below, in dollars per ton. For projects with an approved FDS, the fees shall be based on the year each payment is made.

7.2 Fee Schedules

7.2.1 The costs of NOx reductions are as follows:

Year	Cost of NOX Reductions (\$/ton)
2006	\$4,650.00
2007	\$7,100.00
2008 and beyond	\$9,350.00

7.2.2 The costs of PM10 reductions are as follows:

Year	Cost of PM10 Reductions (\$/ton)
2006	\$2,907.00
2007	\$5,594.00
2008 and beyond	\$9,011.00

7.3 The applicant shall pay the Off-Site Fees in full by the invoice due date within sixty (60) calendar days after the AIA application is approved or in accordance to the schedule contained in the APCO approved FDS.

7.4 The applicant shall receive credit for any off-site emission reduction measures that have been completed and/or paid for, prior to the adoption of this rule, if the following conditions have been met:

7.4.1 The prior off-site emission reduction measures were part of an air quality mitigation agreement with the APCO; or

7.4.2 The applicant demonstrates to the satisfaction of the APCO that the off-site emission reduction measures result in real, enforceable, and surplus reductions in emissions.

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- 7.5 Refund: If a project is terminated or is cancelled, the building permit or use permit expires, is cancelled, or is voided, no construction has taken place, and the use has never occupied the site, the applicant is entitled to a refund of the unexpended Off-Site fees paid less any administrative costs incurred by the APCO. The applicant must provide a written request for the refund, with proof of the project termination, within thirty (30) calendar days of the termination. Proof of project termination can include a confirmation from a local agency of permit cancellation.
- 7.6 The APCO may adjust the cost of reductions according to the following process:
- 7.6.1 An Analysis shall be performed that details:
- 7.6.1.1 The cost effectiveness of projects funded to date;
- 7.6.1.2 The rule effectiveness of achieving the required emission reductions to date;
- 7.6.1.3 The availability of off-site emission reduction projects;
- 7.6.1.4 The cost effectiveness of those projects.
- 7.6.2 The APCO shall provide a draft revised cost effectiveness based on the analysis.
- 7.6.3 The process shall include at least one public workshop.
- 8.0 Administrative Process
- 8.1 Completeness of the AIA application: The APCO shall determine whether the application is complete and contains the necessary information no later than ten (10) calendar days after receipt of the application, or after such longer time as agreed to by both the applicant and the APCO.
- 8.1.1 Should the application be deemed incomplete, the APCO shall notify the applicant in writing of the decision and shall specify the additional information required. Resubmittal of any portion of the application begins a new ten (10) day calendar period for the determination of completeness by the APCO.
- 8.1.2 Completeness of an application or resubmitted application shall be evaluated on the basis of the information requirements set forth in the District Rules and Regulations as they exist on the date on which the application or resubmitted application is received.
- 8.1.3 The APCO shall notify the applicant in writing that the application is deemed complete.

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- 8.2 Public Agency Review of the proposed project: The APCO shall forward a copy of the AIA application, including the MRS (if applicable) to the relevant public agencies for review. The public agencies may review and comment at any time on the provisions of the MRS. Comments received by the APCO shall be forwarded to the applicant. The proposed MRS may be modified, if necessary, based on the input from the public agency. If any changes result from their comments, the APCO shall make the appropriate changes and provide the applicant a revised Off-Site Fee, if applicable. No section or provision within this rule requires action on the part of the public agency.
- 8.3 APCO Evaluation of the AIA Application: The AIA application shall be evaluated for content.
- 8.3.1 If the applicant submits an AIA, the APCO will evaluate the modeling inputs and calculations.
- 8.3.2 If the applicant does not submit an AIA, the APCO will complete an AIA from the information contained in the AIA application.
- 8.3.3 The APCO may, during the evaluation of the application, request clarification, amplification, and any correction as needed, or otherwise supplement the information submitted in the application. Any request for such information shall not count towards the time the APCO has to provide notice of approval or disapproval. The clock shall resume once the APCO has received the requested information.
- 8.4 AIA Approval: The APCO shall notify the applicant in writing of its decision regarding the AIA application and its contents within thirty (30) calendar days after determination of an application as complete and provide the following in writing to the applicant, the public agency, all interested parties as identified by the developer, and make available to the public.
- 8.4.1 APCO approval determination of the AIA application;
- 8.4.2 The required emission reductions;
- 8.4.3 The amount of on-site emission reduction achieved;
- 8.4.4 The amount of off-site emission reduction required, if applicable;
- 8.4.5 The required Off-Site Fee if applicable;
- 8.4.6 A statement of tentative rule compliance;
- 8.4.7 A copy of the final MRS, if applicable; and
- 8.4.8 An approved FDS, if applicable.

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- 8.5 Off-Site Fee: After the APCO approves the AIA application and its contents; the APCO shall provide the applicant with an estimate for the projected off-site fees, if applicable. The applicant shall pay the off-site fee within 60 days, unless a FDS has been approved by the District.
- 8.6 Fee Deferral Schedule: In the event that the applicant had not previously submitted FDS in the AIA application, but desires one, the applicant shall ensure that the proposed FDS is submitted to the APCO no later than fifteen (15) calendar days after receipt of the AIA Approval. The District shall have fifteen (15) calendar days to approve the FDS request.
- 8.7 MRS Compliance: After the APCO approves the AIA application and its contents; the APCO shall enact the MRS contract, if applicable. The applicant is responsible for implementation and/or maintenance of those measures identified within the MRS. Upon completion of Monitoring and Reporting, the District shall provide to the applicant, the public agency, and make available to the public, an MRS Compliance letter.
- 8.7.1 Operational On-Site Measures: On-site emission reduction measures that are active operational measures, such as providing a service, must be implemented for 10 years after buildout of the project, if applicable.
- 8.7.2 Construction Equipment Schedule: The construction equipment schedule shall be submitted to the District if identified in the MRS prior to the start of construction, but not to exceed the issuance of a grading permit, if applicable.
- 8.8 In the event the applicant significantly changes the AIA application or any portion thereof during the Administrative Process, the APCO shall re-start the evaluation process pursuant to Section 8.3.
- 9.0 Changes to the Project
- 9.1 Changes Proposed By The Applicant
- 9.1.1 The applicant may substitute equivalent or more effective on-site emission reduction measures upon written approval from the APCO.
- 9.1.2 Changes in the project or to the build-out schedule that increase the emissions associated with the project shall require submission of a new AIA application. A new AIA shall be conducted and the off-site fees shall be recalculated in accordance with the applicable provisions of this rule. The APCO shall notify the applicant of the new off-site fees, the difference of which shall be payable by the due date specified on the billing invoice.

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9.2 Changes Required By The Public Agency or Any Court Of Law

Project changes that result in an increase in the emissions shall require submission of a new AIA application within 60 days of said changes, or prior to the start of project construction, whichever is less. A new AIA shall be conducted and the off-site fees shall be recalculated in accordance with the applicable provisions of this rule.

10.0 APCO Administration of the Off-Site Fee Funds

- 10.1 The District shall establish and maintain separate accounts for NOx and for PM10 for funds collected under this rule. Any off-site fees collected by the District shall be deposited into these accounts.

- 10.2 The District shall utilize monies from the accounts to fund quantifiable and enforceable Off-Site projects that reduce surplus emissions of NOx and PM10 in an expeditious manner.

10.2.1 The District shall set forth funding criteria for each category of off-site projects that may be funded by this rule.

10.2.2 The District shall ensure that the emission reductions calculations for the off-site projects are accurate.

10.2.3 If the off-site project involves the replacement of existing equipment, the District shall inspect the existing equipment.

10.2.4 The District shall enter into a binding contract with the applicant of the off-site project, which will, at minimum, require an annual report from the applicant that includes information necessary to ensure that emissions reductions are actually occurring.

10.2.5 The District shall conduct inspections on the off-site project to verify that the project is installed or implemented and operating for the life of the contract.

10.2.6 The District may substitute NOx reductions for PM10 in a 1.5 to 1 ratio.

- 10.3 Any interest that accrues in the off-site account(s) shall remain in the account, to be used in accordance with Section 10.2 above.

- 10.4 The District shall prepare an annual report that will be available to the public regarding the expenditure of those funds, and shall include the following:

10.4.1 Total amount of Off-Site Fees received;

10.4.2 Total monies spent;

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10.4.3 Total monies remaining;

10.4.4 Any refunds distributed;

10.4.5 A list of all projects funded;

10.4.6 Total emissions reductions realized; and

10.4.7 The overall cost-effectiveness factor for the projects funded.

11.0 Effective date of this rule

The provisions of this rule shall become effective on March 1, 2006.



California Independent  
System Operator Corporation

California ISO

Renewable Resources and the California Electric  
Power Industry: System Operations, Wholesale  
Markets and Grid Planning

July 20, 2009

Prepared by: California ISO

SJVUAPCD

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### 1) Introduction

The State of California is considering an ambitious increase to its statutory renewable portfolio standard (RPS) from 20 percent by 2010 to 33 percent by 2020. The 33 percent RPS was incorporated into the California Air Resource Board's (ARB) scoping plan for achieving the state's AB 32 targets for greenhouse gas reductions and advanced by other state agencies pursuant to related executive order issued by Governor Arnold Schwarzenegger issued in November 2008 (Order S 14-08).

Along with the state agencies, the electric power industry and the California Independent System Operator Corporation (the ISO) are mobilizing to prepare for the substantial planning, along with the operational, technological and market changes, needed in the power sector to accommodate higher levels of renewables.

The ISO is an independent system operator that provides open access to the transmission system under its control while simultaneously operating the grid and markets for energy, ancillary services<sup>1</sup> and congestion revenue rights.<sup>2</sup> On April 1, 2009, the ISO launched a new market that has the capability to significantly facilitate renewable integration. The new design introduces both day-ahead and real-time markets that use state-of-the-art software to assist in optimizing the use of system resources, while accounting for key constraints on electric power production such as transmission congestion and losses. During the operating day, the ISO now has more accurate procedures to adjust the commitment and output of market resources in response to changing real-time conditions, with dispatch instructions sent every five minutes. This allows for more efficient use of system resources in following the output of variable generation renewable resources, like wind and solar. As a result, the new market will allow more renewable energy to be delivered over the transmission system and less fossil generation will be needed to keep the system in balance.

Because of its experience with reliable system operations and the properties and capabilities of power system infrastructure, the ISO is in a position to clarify and validate the operational requirements, and implement technological solutions, to support higher levels of renewable integration. As a grid planner, the ISO also evaluates and approves options for expanding California's transmission infrastructure in support of renewables at minimum cost to ratepayers, while maintaining compliance with mandatory reliability standards.

New types of technologies and technical specifications are necessary to reliably and efficiently operate the system with high levels of renewables. Technical specifications

<sup>1</sup> Ancillary services refer to a range of additional services needed for system reliability, including operating reserves and regulation, that the ISO procures, or accounts for, when operating the power system. For more details, see Box 2, below.

<sup>2</sup> Congestion revenue rights are financial rights allocated to load-serving entities that provide a hedge against transmission congestion charges.

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(or grid codes) that improve reliability and controllability of variable generation renewable resources are one example. There is also a need for additional energy storage that can adjust its output rapidly in response to the variability of renewable output, including providing regulation services, and take advantage of the potential surplus of wind energy in the overnight (off-peak) hours to store energy for release in the peak hours. Additionally, load shifting and demand response capabilities are needed in response to market prices, along with greatly improved coordination and control of these demand side and storage capabilities and more efficient use of transmission infrastructure through advanced operational technologies, such as envisioned for a "smart grid."

This paper introduces aspects of the ISO core functions and its role in accommodating the state's RPS goal. Section 2, which follows, provides background on the policy and regulatory drivers and the interdependencies among renewables and other policy initiatives. Section 3 provides information on the status of renewables in the California resource mix, with projections to 2020. Section 4 explains how the ISO operational and market systems are being adapted to support renewable integration. Section 5 reviews technological solutions needed for renewable integration over the coming decade and how the ISO plans to facilitate them. Section 6 focuses on the development of generation and transmission infrastructure. This section also discusses the ISO role in ensuring supply adequacy through the state's Resource Adequacy program as well as how renewable resources are considered in the ISO generation interconnection and transmission planning processes. Finally, Section 7 briefly introduces the important regional dimension to renewables development and integration.

## 2) Policy Background

The California Energy Commission (CEC), the California Public Utilities Commission (CPUC), and Local Regulatory Authorities, such as the governing boards of municipal utilities and irrigation districts, share responsibility for implementing the RPS program. The CEC role is principally to certify renewable resources for RPS eligibility<sup>3</sup> and develop a tracking and verification system to ensure that renewable energy output is counted only once for RPS compliance. The CPUC and local regulatory authorities focus on procurement activities of their respective jurisdictional retail sellers of electricity. The CPUC for instance, reviews and approves renewable energy procurement plans (and long-term procurement plans that include renewable integration capabilities), reviews contracts for RPS eligibility, establishes standard terms and conditions for renewable energy contracts, and establishes compliance rules and procedures for investor-owned utilities, electricity service providers, and community choice aggregators. Currently, local regulatory authorities perform similar functions.

The CEC, in coordination with the Western Governors' Association, established the Western Renewable Energy Generation Information System (WREGIS), as the means to comply with its mandate to develop a renewable energy registry and tracking system. The generation information system tracks generation from registered units using

<sup>3</sup> Renewables Portfolio Standard Eligibility (third ed.), <http://www.energy.ca.gov/2007publications/CEC-300-2007-006/CEC-300-2007-006-ED3-CMF.PDF>

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verifiable data and creates renewable energy certificates (RECs) for this generation. The renewable certificates are intended verify compliance with state and provincial regulatory requirements throughout the western interconnection and in voluntary market programs. RECs and energy from a qualified renewable resource procured together as a "bundled" commodity are currently eligible for California RPS compliance purposes. Renewable certificates sold separately from the underlying energy are "tradable" and are not presently eligible for RPS compliance, although the CPUC has statutory authority to permit the use of tradable RECs.

### Other Policy Drivers and Interdependencies

Renewable energy policy is increasingly closely tied to climate policy. In 2006, California enacted Assembly Bill 32, which requires that the state reduce its GHG emissions to 1990 levels by 2020. AB 32 envisions reducing GHG emissions across several economic sectors, including from the electric power and transportation sectors, with a cap-and-trade system to allow for efficient reduction options. The first compliance year is 2012. Emissions from electric power plants, including imports, comprise about 23 percent of total California GHG emissions. While imports account for about 22 percent of the total electricity consumed in the state, they account for about 50 percent of the GHG emissions associated with electric power.

AB 32 directs ARB to develop specific reductions by sector and establish the mechanisms to achieve the goals. The ARB Scoping Plan has three major measures that substantially affect the power sector:<sup>4</sup>

- 33 percent RPS, which is estimated to result in 21.3 million metric tons of carbon dioxide equivalent (mmtc) reductions or approximately 14.5 percent of reductions from the capped sectors.
- Energy efficiency requirements, which are estimated to result in 26.6 mmtc reductions or approximately 18 percent of reductions from the capped sectors.
- A cap and trade system developed through the Western Climate Initiative, which will assign an emissions cap to all emitting generation within California and all imports, based on rules that are still in development.

Other measures that will affect the electric power sector include ship electrification in ports (up to 3.7 mmtc) and California's million solar roofs initiative (2.1 mmtc). Electrification of vehicles will also shift emissions from the transportation sector to the electric power sector with the goal of a net reduction in emissions, in part because of the opportunity to charge vehicles using renewable energy.

To the extent that increases in portfolio standards are used to achieve greenhouse gas reductions, the success of the effort will require substantial innovation in regulatory mechanisms, planning and markets. For example, demand response, storage technology, and, in later years, increased use of electric vehicles have the potential to facilitate the integration of variable generation *and* reduce GHG emissions. Success in developing

<sup>4</sup> The ARB scoping plan is available at <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

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and deploying these and other new tools and technologies is critical. Similarly, it will require an extraordinary effort to transform the electric transmission system and drive significant changes in how the ISO operates the system in compliance with federal reliability standards. Complicating the integration effort are other important environmental objectives such as limiting the use of once-through cooling (OTC) technology in coastal power plants and reducing air emissions in southern California. This paper discusses the range of technology, market and transmission infrastructure issues so essential to the state's success in this critical effort.

## 3) Renewables in the California Resource Mix to 2020

For perspective on the magnitude of the investment to achieve current and proposed RPS goals and the potential implications of cap and trade or other carbon pricing mechanisms, once-through-cooling limitations, and other policy choices, it is helpful to understand the current resource mix used to meet California's system needs. The following table, developed by the CEC, summarizes the sources of total system electric energy for the state in 2008.

2008 Total System Electric Energy in Gigawatt Hours					
Fuel Type	In-State Generation <sup>[1]</sup>	Northwest Imports <sup>[2]</sup>	Southwest Imports <sup>[2]</sup>	Total System Power	Percent of Total System Power
Coal*	3,977	8,581	43,271	55,829	18.2%
Large Hydro	21,040	9,334	3,359	33,733	11.0%
Natural Gas	122,216	2,939	15,060	140,215	45.7%
Nuclear	32,482	747	11,039	44,268	14.5%
Renewables	28,804	2,344	1,384	32,532	10.6%
Biomass	5,720	654	3	6,377	2.1%
Geothermal	12,907	0	755	13,662	4.5%
Small Hydro	3,729	674	13	4,416	1.4%
Solar	724	0	22	746	0.2%
Wind	5,724	1,016	591	7,331	2.4%
<b>Total</b>	<b>208,519</b>	<b>23,945</b>	<b>74,113</b>	<b>306,577</b>	<b>100.0%</b>

Note: In earlier years, the in-state coal number included coal fired power plants owned by California utilities located out-of-state.

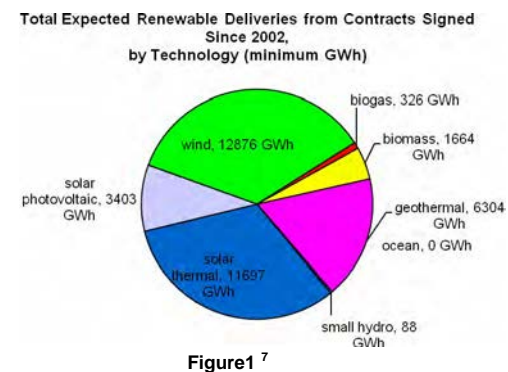
1. In-state generation: Reported generation from units 1 MW and larger.
2. Net electricity imports are based on metered power flows between California and out-of-state balancing authorities.
3. The resource mix is based on utility power source disclosure claims, contract information and calculated estimates on the remaining balance of net imports.

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In 2008, the three large IOUs supplied approximately 13.7 percent of their total sales from eligible renewable resources.<sup>5</sup> Even accounting for the economic downturn, it is clear that California utilities must nearly double the quantity of energy supplied from renewable resources simply to meet the near-term 20 percent RPS target. The CPUC has acknowledged that the gap between the current contribution from renewable resources and the statutory objective is unlikely to close until 2012-2013,<sup>6</sup> assuming that generation under contract actually materializes. .



The current IOU renewables contracts include substantial technological and geographic diversity. As shown in Figure 1 above, wind and solar resources represent roughly equal components of the total capacity under contract, with nearly 50 percent of the total wind capacity under contract from out-of-state resources. Only 14 percent of the overall amount under contract is online and incorporated into the energy output calculated in Figure 2.<sup>8</sup>

From a system operations perspective, the geographic and technological diversity of the contracted resources provides benefits by reducing the variability of the renewable

<sup>5</sup> See <http://www.cpuc.ca.gov/NR/rdonlyres/9BFE4B8B-BBD7-405D-A58A-0155083578E7/0/090210CPUCPresentationforSenEUChearingofSB14.pdf>

<sup>6</sup> See [http://docs.cpuc.ca.gov/word\\_pdf/REPORT/85936.pdf](http://docs.cpuc.ca.gov/word_pdf/REPORT/85936.pdf)

<sup>7</sup> The source for Figure 2 is the CEC at [http://www.energy.ca.gov/portfolio/contracts\\_database.html](http://www.energy.ca.gov/portfolio/contracts_database.html).

<sup>8</sup> See [http://www.energy.ca.gov/portfolio/contracts\\_database.html](http://www.energy.ca.gov/portfolio/contracts_database.html).

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resources. Diversity mitigates variability to some extent because wind and solar radiation patterns vary over large geographic regions and while wind production peaks at night on average, solar resources peak during the day (although not at peak demand hours during some times of year in California). However, as noted by the CPUC, the heavy reliance on largely untested, but transformational, technology, in the portfolios currently under contract such as solar thermal resources, contributes to implementation delays and may not strike the correct balance between in-state job creation and consumer costs.

To establish an analytical framework to evaluate policy considerations and provide an initial quantitative analysis of the costs and risks of alternative means of achieving a 33 percent RPS by 2020, including timing considerations, the CPUC has developed and studied four possible renewable resource portfolios scenarios:<sup>9</sup>

- **33 percent RPS Reference Case** – This represents current renewable procurement practices, which include significant reliance on solar thermal technologies.
- **High Wind Case** – This demonstrates less reliance on in-state solar and more reliance on wind.
- **High Out-Of-State Delivered Case** – This places greater reliance on out-of-state renewable resources and includes the construction of new transmission lines to deliver the energy to California. This scenario does not assume the ability to use tradable RECs to meet RPS obligations.
- **High Distributed Generation Case** – This relies on large penetrations of smaller-scale renewable generation connected at the distribution level.

The underlying resource mix will have a profound impact on achieving California's policy objectives. Each resource strategy performs differently when measured against regulatory or policy criteria, including local air quality, land use impacts, cost minimization and timing of implementation. For example, as evaluated by the CPUC, the high distributed generation case has cost and operational reliability considerations that are not well understood, but it would reduce the need for high-voltage transmission infrastructure and its potential political and environmental risks. In contrast, the high wind case may trigger operational concerns due to substantial over-production in the off-peak hours. Integrating renewables under this scenario would require significant coordination with energy efficiency and storage technologies (see discussion below), to shift energy consumption to periods of high wind production.

The ISO is currently updating existing and developing new statistical and production simulation methodologies to evaluate these portfolios. Some of this analysis will help state agencies clarify their own objectives in the transition from 20 percent to 33 percent RPS. The focus of this analysis is both the operational requirements that the portfolios are likely to entail (see discussion in the next section) as well as determining the portfolio of generation resources and integration technologies that would be most cost-effective. As discussed in the transmission planning section, the ISO is also engaged with renewable transmission planning to achieve the 33 percent RPS.

<sup>9</sup> This report can be found at <http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/33implementation.htm>.

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### 4) System Operations and Wholesale Markets in Renewable Integration

The remainder of this paper addresses the core functions of the ISO and its role in renewable integration. Two of the ISO's core functions are the reliable operation of the power system concurrent with the operation of spot markets that provide energy and other services and capabilities to ensure reliability.

ISO power spot markets are a specialized type of commodity market in that any trading must be consistent with: (a) the physical laws that govern power flows, (b) the need to balance the system second-by-second, and (c) management of the many physical and reliability constraints that affect the operation of both generation and transmission facilities — particularly the congestion and losses associated with transmission use. Because of these features, the ISO conducts many of its operational and market functions through fully integrated processes. As will be described further below, the ISO markets are in fact largely designed around system operations, and the prices generated in those markets provide information relevant to future operational needs.

In April 2009, the ISO implemented a redesigned wholesale market for energy and ancillary services along with upgrades of software and information technology systems. So now, energy prices are calculated a day-ahead and during the operating day for over 3,000 locations on the 75 percent of the California grid operated by the ISO. Market power and market gaming are carefully mitigated. The new market and system operational capabilities will be particularly useful in the next decade given that renewable integration will likely become the major driver of operational needs on the power system. ISO market prices and energy procurement will guide efficient use of California's power system infrastructure, especially when supported by new technologies such as those making up the smart grid. The ISO markets are complementary to the long-term bilateral contracts entered into by load-serving entities, which are governed by the CPUC's Long-Term Procurement Plan. As with other commodity markets, spot prices for each service transacted in the ISO markets will influence the forward prices for power and capacity negotiated in bilateral contracts.

#### Operating Characteristics of Wind and Solar Resources

Before considering how ISO system and market operations will assist in renewable integration, it is important to understand the properties of the major types of renewable resources — especially the “intermittent” or “variable generation” wind and solar resources.<sup>10</sup> These properties are: variability of their output; and the uncertainty over their output prior to actual performance, as reflected in the errors associated with wind

<sup>10</sup> “Variable generation” has become the latest terminology for resources whose output is based on a fuel source that has variable performance. See NERC, *Special Report: Accommodating High Levels of Variable Generation to ensure the reliability of the bulk power system*, April 2009. Available at [www.nerc.com](http://www.nerc.com).

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and solar forecasts. Figure 2 shows the variability of wind output in a typical month by hour of the day. Figure 3 shows the variability of a solar PV panel due to transitory cloud cover. Another aspect of wind variability and uncertainty is the possibility of sharp, and difficult to predict, spikes in wind output. Figure 4 shows such a spike during a storm, plotted with the magenta line, which illustrates a 360 MW jump in 20 minutes.

The adaptation of power system operations to high levels of variable generation renewables has just begun in the United States. System operators have many years of experience with the variability of *demand* over different operational time-frames but do not have the same experience with supply. The output of conventional generation is extremely predictable and subject to operator control. Unplanned outages and deratings (or lowering the capacity of generation and transmission) are factored into reliable system operations, and failure to respond to dispatch instructions is subject to penalties. In contrast, wind and solar generation vary over short periods of time with changes in the weather, and they largely lack controllability (although, as discussed below, modern wind and solar technology can have substantial control capabilities). These issues pose challenges that the ISO is addressing through a variety of technology, market and planning initiatives described in the next sections of this paper.

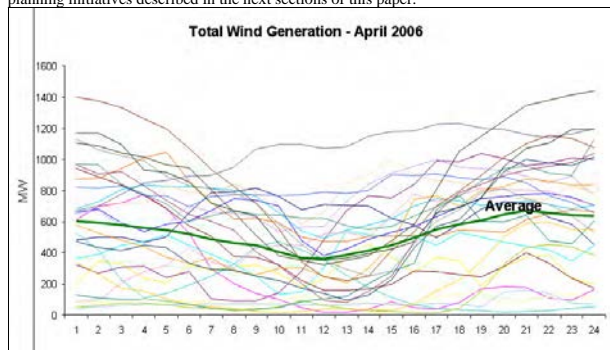


Figure 2

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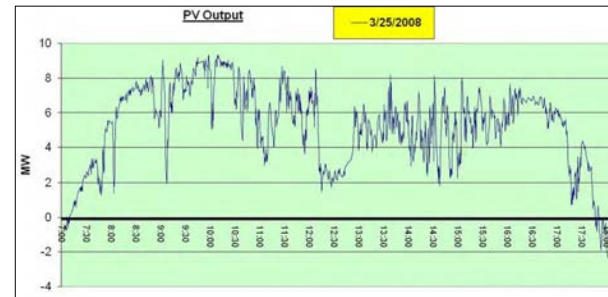


Figure 3

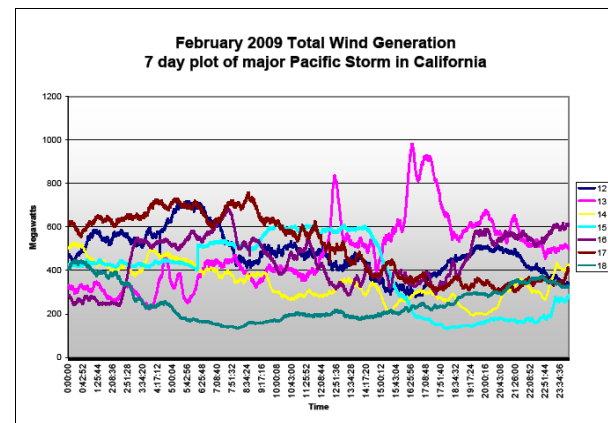


Figure 4

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#### Improved Forecasts Facilitate Renewable Integration

Wind and solar output forecasts take place in several time-frames, including prior day, those that take place between one and several hours before the operating hour, and much shorter term forecasts that are used within the operating hour. Improving forecasts will clearly support more efficient renewable integration by allowing the ISO to commit and dispatch other types of generators more accurately to account for renewable variability. Less accurate forecasts will result in over-scheduling of thermal resources due to uncertainty of wind production, leading to higher energy and ancillary service costs and possibly higher GHG emissions.

Forecasting quality improvement comes from better input data regarding the day ahead forecasted wind speed and the wind direction at the 80 meter level for each of the large wind generation areas.

A second forecast issue is the difficulty in predicting large energy ramps, both up and down, from variable generation resources, as shown in Figure 4 above. Wind generators can quickly shut down when wind speeds exceed safe operating limits. As a result, a big storm front with high wind gusts can first result in a substantial spike in output, followed by the loss of hundreds of megawatts energy from wind generation over a short period of 10 to 20 minutes. Also wind shear conditions at a wind facility may result in the units going from zero to full output within a few minutes when the wind shear condition changes and the wind hits the turbines instead of passing above the units. The ISO is working with the Bonneville Power Administration and forecasting companies to improve the tools for predicting these types of energy spikes and to make this information available to ISO operators.

#### Operational Requirements For Renewable Integration

In its 2007 study of renewable integration (see Box 2, below), the ISO developed methodologies to quantify additional operational capabilities needed to support variable generation renewables.<sup>11</sup> These included estimates of changes in load following<sup>12</sup> capacity and ramp, regulation capacity and ramp, and the morning and evening energy ramps. Ramp refers to the rate of change in output of one or more generators or other resources, typically measured in megawatts per minute or megawatts per hour. The requirements were developed under a scenario of the 20 percent RPS being achieved through additional wind resources at Tehachapi. Some of the findings are summarized in Box 1, below.

The ISO concluded that some prior integration studies had underestimated certain operational requirements. For example, the 2007 study estimated that the ISO's procurement of regulation services<sup>13</sup> could more than double in certain hours of the day

<sup>11</sup> The study is available at <http://www.caiso.com/1e51/1e51c7946a480.html>.

<sup>12</sup> Load following is defined as the difference between a unit's hourly schedule for energy and the deviation from that schedule that operators instruct in each five minute dispatch interval.

<sup>13</sup> Regulation is an ancillary service that provides continuous balancing necessary to compensate when the energy dispatched by the system operator, along with interchange schedules, every 5 minutes does not

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to account for unexpected wind variability. This estimate, based on analysis of actual operating data, is much higher than prior studies.

A further recommendation of the report was that renewable integration, especially at higher levels, requires increased flexibility of system resources, including increased participation by storage and demand response. The generation fleet needs lower minimum operating levels (to reduce over-generation conditions), faster ramp capability, and additional Regulation capacity. Characteristics of other resources are described below. The power system also needs to maintain sufficient inertial response, especially as thermal generators are potentially displaced at higher levels of renewables.

Analysis of operational requirements must further verify that the generation commitment and dispatch itself is able to meet these requirements under different scenarios of renewable resources, and given the uncertainty created by forecast error. To evaluate these scenarios, the ISO recently conducted unit commitment simulations with a 20 percent RPS that also considered day-ahead and hour-ahead forecast errors as well as 10 minute dispatch intervals to approximate real-time conditions. Initial findings suggest that, within the assumptions and limitations of the simulation, the generation fleet can be optimized to operate without violating regulation capacity or ramp constraints. However, there are certain limitations of the analysis, such as the inability to account for intra-hour forecast error. The ISO is evaluating next steps needed to verify the operational capabilities of the system with 20 percent and higher RPS.

balance actual demand in that interval. The mismatch could be caused by short-term load forecast errors and/or other changes on the system.

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### Box 1. Transmission and Operating Issues Associated with Renewable Resource Integration

In November 2007, California ISO released a study of the transmission and operating issues associated with achieving a 20 percent RPS, largely through additions of wind resources in the Tehachapi area. The study consists of several components. Transmission system analysis includes transient stability and post-transient voltage stability of the ISO grid; evaluation of wind plant function characteristics necessary to achieve acceptable static and dynamic performance. The operational issues analysis includes assessment of overall ramping requirements (MW/min), load-following capacity (MW) and ramping requirements, and regulation capacity and ramping requirements. The study also evaluated over-generation issues and potential solutions.

Among the major findings of the analysis was that the transmission upgrades for the Tehachapi area are sufficient to support up to 4,200 MW of additional wind resources. Moreover, up to an additional 800 MW/hr of generating capacity and ramping capability will be required to meet the multi-hour ramps, along with substantial increases in regulation procurement. The ISO has to have the authority to curtail wind generation during overgeneration conditions. The study and follow-up projects to support its conclusions and extend the analysis can be found at <http://www.caiso.com/1c51/1c51c7946a480.html>.



### ISO Market and System Operations Processes Facilitate Renewable Integration

The California ISO, like all U.S. independent system operators, has an integrated approach to market and system operations that facilitates scheduling and dispatch of renewable and non-renewable resources.<sup>14</sup> By “integrated”, we refer to the fact that the physical constraints and state of the infrastructure on the system to which grid operations must adhere – generator operating constraints, transmission constraints, generation and transmission outages or deratings, and so on – are considered when setting schedules and prices for energy and ancillary services in the ISO’s day-ahead and real-time wholesale markets. More information on these markets and system operations can be found in the ISO’s business practice manuals;<sup>15</sup> this section provides information to explain features applicable to renewable integration.

<sup>14</sup> For a survey of how ISOs facilitate renewable integration, see ISO/RTO Council, “Increasing Renewable Resources: How ISOs and RTOs Are Helping Meet This Public Policy Objective,” October 16, 2007, available at [www.isorto.org](http://www.isorto.org).

<sup>15</sup> See in particular the BPM for market instruments and the BPM for market operations. These are available at <http://www.caiso.com/17ba/17baa8bc1cc20.html>.

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### Day-Ahead Market: Anticipating Demand and Operating Requirements

Because generation resources have different start-up times (ranging from more than 24 hours for large steam units to under 10 minutes for gas turbines), all system operators must begin the process of scheduling generation before the operating day. The ISO first lets the day-ahead market provide this schedule and then makes adjustments using its own load forecasts. The day-ahead market and scheduling procedures begin at 10 a.m. on the day prior to the operating day. That is the deadline for submitting price and quantity bids (\$/MWh) from generation or demand response that can potentially supply spot energy or ancillary services – regulation and operating reserves (see Box 2). In addition, all bids to buy energy (\$/MWh) to serve the next day’s load and non-price schedules, or self-schedules (MWh) – requests to inject and withdraw power independent of the market price – must be submitted at the same time.<sup>16</sup> If the ISO was to procure the additional regulation requirements identified in the 2007 report for renewable integration, it would take place in this market.

Following a procedure to mitigate generator bids for market power if necessary, and to pre-position certain generation units that are needed for local reliability,<sup>17</sup> the bids and schedules are co-optimized through an auction called the integrated forward market. “Co-optimized” means that the auction algorithm allows for the optimal use of a generator – to provide the most cost-effective mix of energy and regulation and operating reserves – in each hour of the day. The forward market results in day-ahead hourly

### Box 2. What are Ancillary Services?

Ancillary services are additional services provided by generation and, increasingly, non-generation resources, such as demand response and storage, that are needed for power system reliability. As discussed elsewhere in this report, ancillary service procurement may increase with additional renewables. Two types of ancillary services are procured by the ISO through the wholesale markets: operating reserves and regulation. Operating reserves are essentially capacity retained on generators that can be converted to energy in a short period of time in order to respond to contingencies such as the loss of a generating resource or a transmission line. There are two types of operating reserves in the ISO markets: ten-minute spinning reserves, provided by resources that are synchronized to the grid, and ten-minute non-spinning reserves, provided by resources that are not synchronized but can start and provide energy within ten minutes. Regulation is energy provided on a second-by-second basis for system balancing by resources equipped with automatic controls. Currently provided by thermal generators and hydro systems, regulation could be supplied also by demand response and storage technologies. The ISO also meets other ancillary services requirements that are not procured through the markets, such as voltage support and black-start.

<sup>16</sup> These types of non-price schedules, which can be submitted by supply and demand resources, are given a scheduling priority in the market, are price-takers for settlement purpose, and are only altered when the market is unable to clear based only on price-quantity bids.

<sup>17</sup> Local reliability includes capacity requirements and transmission system requirements, such as voltage support, that must be provided by generators at particular locations on the grid. More information on local reliability assessment procedures and Reliability Must Run contracts can be found at <http://www.caiso.com/docs/2001/10/15/2001101510100413037.html>

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schedules for generators whose bids were accepted by the market and ensures that self-schedules are feasible. It also calculates prices applicable to each generator location, called locational marginal prices and averaged prices for load in the service territories of the investor-owned utilities (and other entities that request such prices), called load aggregation points. Prices and schedules are determined simultaneously and reflect congestion and losses at each location. A market participant that offered to sell 100 MWh of energy at \$50/MWh at its location will be scheduled for those hours in the next day in which power at its location is worth \$50/MWh or more, but not for those hours in which power at its location can be delivered from other generators for less than \$50/MWh.<sup>18</sup> Generally, more than 90 percent of next-day demand is cleared through the forward market.<sup>19</sup>

Currently, there is no requirement, and only weak financial incentives, for renewable resources to schedule or offer their power into the forward market (as discussed below, most renewable resources today bid or schedule only in the real-time market, which occurs hourly in advance of the operating hour). There is some scheduling day-ahead of wind resources, but little compared to expected next-day output. As the ISO sees additional renewable energy generation at higher RPS levels, this lack of day-ahead scheduling will lead to increased over-commitment of thermal generation (to minimize the risk of a supply shortfall) and a divergence of prices between the day-ahead and real-time market. Hence, a need exists to change in the incentives for renewable resources to schedule day ahead, or possibly the participation in the forward market by financial entities that can anticipate next-day renewable output.

After the forward market, the ISO conducts the first of several adjustments to the next-day schedule for energy and capacity in its residual unit commitment process. This uses the ISO's next day load forecast for each hour and commits any additional resources needed. The ISO may also "decommit" resources after the unit commitment process if it appears that the forward market scheduled an excess of supply. With the development of its improved day-ahead wind forecast, the ISO anticipates that the unit commitment process will be adjusted to compensate for expected wind output in the operating day. The unit commitment is the last formal step of the day-ahead process to prepare the power system for the operating day.

<sup>18</sup> A generator's start-up cost (\$) and cost to produce at its minimum operating level (\$/MWh) are also considered in the auction solution. Hence, if a generator has a high start-up cost compared other generators with similar Energy bid prices, it may not be scheduled to run even when its Energy bid price is at or lower than the cost of Energy at its location.

<sup>19</sup> The forward market has certain bidding and scheduling requirements on supply and demand. Most non-hydro and non-renewable generators that are listed as resource adequacy generators under the CPUC's resource adequacy program have to schedule or offer their full amount of resource adequacy capacity into the forward market. On the demand side, load-serving entities have to schedule most of their load or be subject to penalties for under-scheduling. In addition, load that was not scheduled in the forward market and shows up in real-time will pay for the costs of starting additional generation units and may be exposed to more volatile energy prices for supply. Given these incentives, the ISO expects that the supply and demand cleared in the forward market will reasonably approximate the actual next day demand. However, there is no obligation on load-serving entities to fully schedule in the forward market, which is why the RUC procedure based on the load forecast, described below, is needed to ensure sufficient unit commitment for the next day.

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### The Real-Time Operational Procedures and Markets: Adjusting to Actual System Conditions

With the day-ahead schedules finalized, the ISO begins a series of interlocking procedures that conduct further adjustments to the schedules prior to the operating hour. These are called collectively the real-time market, although calculation of actual market prices is the last step in this process. A single bid submission that closes 75 minutes prior to each operating hour is used for all components of the real-time market. The first step is the hour-ahead scheduling process, which takes place 60 minutes prior to the operating hour and whose main function is to schedule power across the ISO interties (that is, imports and exports). This hourly procedure is needed because interchange schedules between the ISO and its neighbors are typically established for a full hour. The hour-ahead timeframe is also when the ISO finalizes output schedules for the operating hour for its wind resources. This process is described in more detail below.

Following the hour-ahead scheduling process, the ISO next conducts several look-ahead forecasts to commit additional generation units that can start in the time horizon being evaluated. These procedures can also procure any additional ancillary services needed on a 15-minute interval basis.

Finally, for every 5 minutes of the operating hour, the ISO sends dispatch instructions to generators, to increase or decrease their energy output. The 5-minute dispatch is a particularly useful mechanism to support renewable integration because the smaller the time-step of the dispatch, the better the ISO can adjust the output of non-renewable generators needed to balance wind or solar variability. Within the 5-minute dispatch interval – that is, in between the dispatch instructions – any differences between the actual load and the energy produced by responses to dispatch instructions and interchange schedules is made up by generators on regulation. These units provide regulation services through automatic generation controls. As discussed below, the ISO envisions the development of new storage and demand response regulation energy capabilities to meet regulation requirements when more renewable generation is on-line.

In the future, the ISO and other power system operators will also explore new algorithms that account for the uncertain nature of renewable output in the unit commitment process and real-time commitment decisions. Such algorithms will further improve market efficiency.

### Participating Intermittent Resource Program: Reducing the Cost of Selling Wind Power

Because of the variability of wind, and to some degree, solar generation, these renewable resources experience significant differences between their scheduled and actual output, called an "imbalance." For example, based on its hour-ahead forecast, a wind farm with 120 MW of capacity could schedule to produce 100 MW over the hour between 8 am and 9 am, but then actually produce in a range between 50 MW and 120 MW in any particular 5-minute dispatch interval during the hour. When a wind resource is producing below its scheduled output, the ISO has to increase the output of other generation for that

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period; and when it is producing more than its scheduled output, the ISO may have to back down some other generation, which may also incur costs if that generation has already been paid for its output in the day-ahead market.

In the early 2000s, the financial risk of being exposed to the wholesale market costs of these energy imbalances was seen as a significant impediment to wind resource development. To address this issue, the ISO and market participants fashioned a program in 2003 and 2004, called the Participating Intermittent Resources Program. This program had two primary aims: first, to obtain telemetry from wind resources for purposes of establishing a more accurate forecast for those resources, and second, to reduce the imbalance costs to those resources that provided the telemetry. Participating resources provide telemetry to a wind forecast vendor, which provides them with an hour-ahead wind schedule that they in turn submit to the ISO. Resources that submit these schedules are charged a monthly averaged energy imbalance charge.<sup>20</sup> The result is a small subsidy to the wind resources from the buyers in the real-time wholesale market (who pay for all real-time energy at its actual cost), and a large reduction in the financial risk of participation in the market for wind generators.

However, as the amount of wind and other variable renewable energy on the system increases, the market and operating implications of the difference between scheduled and actual output could become larger, depending on the capabilities of other resources on the system, such as storage. The ISO will work with stakeholders to develop the correct incentives to achieve a higher degree of day-ahead scheduling of renewable output, as well as more capability on the part of variable generation renewables to respond to market-based dispatch instructions and price signals. Done correctly, these changes will actually increase the ability of the power system to absorb renewable energy.

### Developing and Enhancing the ISO Wholesale Markets

The ISO's priority for 2009 has been to start the redesigned markets for energy and ancillary services and resolve any initial implementation issues. As the ISO obtains experience with these markets, and as the operational requirements of renewable integration become clearer, the ISO will initiate any market design changes needed to achieve the state's renewable goals efficiently and reliably.<sup>21</sup> Such design changes and any new market products would be intended to provide needed revenues for the types of operating characteristics needed over time.

For example, the ISO's 2007 report (see Box 1 above) pointed to the potential need for additional regulation services in certain hours, which would require changes to the current market procurement procedures for this product. That report also quantified increased ramping requirements needed on the system. The ISO has started to examine

<sup>20</sup> Both the locational marginal price and the deviations from the schedule are averaged over the month.  
<sup>21</sup> These market design changes are listed in the Catalogue of Market Design Initiatives, currently under development for 2009-2010. See <http://www.caiso.com/fb1/fb185636d6d0.html>.

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changes to the market design that would serve to elicit additional ramp capability. Several types of technology solutions are discussed in the next section.

Some market enhancements that may impact renewable integration are already in the pipeline for 2010-2011. These include measures to administratively increase prices for ancillary services and energy during shortages of those products (called "scarcity pricing"), which could provide price signals for the market to provide additional capability to deliver these services. Such scarcity may occur because of renewable integration requirements (as well as in general to conditions of shortages in energy and capacity). The ISO will also introduce financial bids in the forward market that can improve convergence of day-ahead and real-time prices (called "convergence bidding"). These bidders would have the incentive to displace thermal generation that is scheduled when wind resources do not schedule day-ahead, potentially improving the efficiency of the ISO's scheduling and commitment processes.

### Improved Operational Tools

The added variability introduced into the bulk power system by increased levels of renewable resources requires operational tools that improve the situational awareness and reactive capabilities of the ISO and transmission operators throughout the western interconnection. Some of these tools will likely build from the ongoing deployment of synchrophaser measurement tools. This technology provides for sub-second monitoring of grid conditions and thus enhances the ability of system operators to deliver interconnection-wide networking, event analysis, model validation and real-time controls on a wide-area basis. By improving detection and mitigation of power system vulnerabilities, synchrophaser technology can significantly increase the reliability of the interconnection, and allow for the release of latent transmission capacity at very low cost to foster a more robust west-wide market for renewable energy.

Other tools must be developed to forecast operational reliability problems associated with increased renewable variability. As noted above, the ISO's 2007 study has identified an increase in regulation and ramping requirements for renewable integration. Accordingly, in addition to improved forecasts and other measures to continuously improve market efficiency, the ISO is developing a tool to forecast the ability of resources in the day-ahead and the operational time-frames to meet expected load and variable generation ramp requirements. It does so by applying the most up-to-date load forecast, wind forecast, market data and related correlation of wind and load. The result will be recommendations to incorporate into market systems or used by operators to enhance reliability through greater situational awareness.

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### Box 3. International Comparisons of Renewable Integration

In its 2007 Integration of Renewable Resources report, the ISO provided a brief review of international experience with renewable integration. The ISO advanced this effort in 2008 through an evaluation of Spain's grid operators at Red Eléctrica de España (REE). With a system-wide peak load of 45,500 MW, REE depends heavily on flexible generation to back up its nearly 15,000 MW of installed wind, which supplies 10 percent of the country's total electric power. Currently, 19,838 MW of installed combined-cycle gas generation and 4,800 MW of pumped hydroelectric generation are used to meet REE's load ramps of up to 4,000MW/hr and wind ramps of up to 1,172 MW/hr upward and 785 MW/hr downward. In fact, Spain has a total capacity of over 80,000 MW, much built to accommodate the growth in wind. To facilitate the integration of wind into their operations, REE manages a centralized renewable generation control center, which collects all information about current wind generation and provides a centralized forecast. All wind production facilities with total installed capacity of 10 MW or greater must be controlled by a compliant control center, and be able to execute orders within 15 minutes at all times. Other measures used by REE include roughly 2,500 MW of load that is interruptible up to 10 times per year, as well as mandatory regulation service margins of 1.5 percent of installed capacity from all generators connected to the grid. REE typically has as much as 1,000 MW of regulation capacity available to meet swings in load and wind. Using these measures, REE reliably meets the demands that wind puts on their system. However, REE still faces significant challenges in managing congestion caused by wind, as well as reliability issues such as trips at wind generators caused by low-voltage conditions.

### 5) Technology Solutions To Facilitate Renewable Integration

New types of technologies and technical specifications are necessary to achieve renewable integration, especially given the variety of environmental policies being implemented within just a few years.

#### Interconnection Standards (Grid Codes)

There is a recognized interrelationship between the design standards of generation and other supply and delivery equipment and the standards related to the overall performance of the bulk power system as adopted by reliability entities, such as the North American Electricity Reliability Corporation, the Western Electricity Coordinating Council and the ISO. Individual components of the power system must be designed to contribute to or, at a minimum, not harm, the ability of the bulk power system to maintain its integrity during system emergency events and diverse operating conditions. It is, therefore, important that a set of interconnection performance standards be applied to variable generation and other innovative technologies, including storage devices, to avoid system reliability degradation. For instance, the Federal Energy Regulatory Commission in its Order No. 661 adopted low-voltage ride through standards for wind generation that prevent such resources from tripping off during specific voltage conditions. Other functions must also be addressed as the magnitude and diversity of renewable technologies increase and more variable generation interconnects at the distribution system level. These functions include:

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- Voltage regulation and reactive power capability
- Low and high voltage ride-through
- Inertial-response
- Ramp rate and curtailment control
- Frequency control (governor action)

Modern wind turbine designs (Type 3 and 4 generators)<sup>22</sup> can be designed to provide many of these system performance functions. The expected performance of newly developed utility-scale photovoltaic and solar thermal generators is much less well understood.<sup>23</sup> However, solar thermal technologies are expected to exhibit characteristics more similar to conventional generators. Moving forward, it is necessary for system operators and generation developers to have consistent and well-defined expectations regarding the contribution of variable generators to maintaining system performance.

#### Energy Storage

A key characteristic of electric power production and the power market is the high cost of storage options. Most current storage takes place in hydro systems, whether through river dams (which store water for long periods of time before generating during the peak months) or pumped storage (which stores water at night when power is lower cost for release during the peak hours of the next day). Pumped storage is an ideal resource for renewable integration, but is difficult to site and can take an estimated 10-12 years to permit, license and construct. Other storage options, such as batteries and compressed air systems, are developing utility-scale capacity but are still expensive. These are discussed briefly in the box below. Nevertheless, the economics of storage generally should be improved by its ability to provide the operational needs created by renewable integration and the possible increase in off-peak to peak price spreads for energy, especially when greenhouse gas emissions are also assigned a cost. A large amount of storage on the system would greatly improve system operations at higher RPS.

Energy storage resources have a number of characteristics that are particularly suited for facilitating renewable integration. They can provide a fast response to control signals, frequency response and automated dispatch commands. They have high ramp rates and are easy to start and stop. They are thus well-suited providing the regulation services that the ISO has identified as potentially important to renewable integration. On a larger scale, such as pumped storage, storage can substantially shift loads and take advantage of the potential off-peak surplus in clean energy (due to excess wind production) and mitigating overgeneration conditions. Plug-in hybrid electric vehicles and fully electric vehicles are also, by definition, storage devices since they operate using batteries.

<sup>22</sup> Type 3 wind turbines are double-fed induction (asynchronous) generators and Type 4 wind turbines are considered full-conversion generators in that the latter passes all turbine power output through an AC-DC-AC power electron converter system.

<sup>23</sup> Solar thermal generators focus direct normal irradiance to heat water or oil that is then used to produce steam to drive a large conventional electric generator. Photovoltaic technology converts energy in sunlight directly to direct current. (See, NERC "Accommodating High Levels of Variable Generation", special report (April 2009) available at [www.nerc.com](http://www.nerc.com))

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The ISO is currently working to establish viable rules for smaller-scale, energy limited storage resources, such as batteries and flywheels, to interconnect and participate in the ancillary services markets. The ISO also will review proposals for larger scale storage projects as well as transmission projects that can increase the capacity of existing pumped storage plants. The ISO anticipates stepping up these efforts to ensure that maximum support is available to meet RPS.

**Box 4. Types of Energy Storage Technologies**

**Pumped hydro** generates electricity by pumping water into upstream reservoirs when demand is low and running the water through turbines when demand is high. It is the most widespread energy storage system on power networks. Several new pump-hydro systems have been proposed for construction in California and may be on-line by as early as 2016. These new units can provide regulation services and operating reserves, while also shifting large amounts of energy from off-peak periods for delivery at peak load times.

**High-Speed Flywheel systems** utilize a massive rotating cylinder and can provide fast regulation services. New designs are based on clustering individual units to provide MW scale energy storage.

**Battery Storage**, which includes lithium ion batteries and sodium sulfur batteries, can provide 15 to 60 minutes of energy storage and provide regulation services.

**Compressed Air Storage** can utilize abandoned gas and oil wells, or alternatively pipelines or above ground tanks, to store compressed air and recover it for use in a typical turbine generator.

**Super capacitors**, or electrochemical capacitors, possess swift charge and discharge capabilities. More powerful than batteries, they can be cycled tens of thousands of times. Those with energy densities under 20kWh/m<sup>3</sup> have been successfully developed, and larger units are in development.

**Flow batteries** have low energy density, but they offer high capacity and independent power and energy ratings. Technologies in use include polysulfide bromide (PSB), vanadium redox (VRB), and zinc bromide (ZnBr).

**Plug in Hybrid Vehicles (PHEVs)** can in principle be used as battery storage resources for use on the grid -- a concept called Vehicle to Grid (V2G).

Demand Response

Increased price-responsiveness by power consumers will also facilitate renewable integration. As with storage, there is much interest in demand response, which as a resource can potentially follow the variability of renewable output, either through direct dispatch signals sent by the ISO to or through the direct actions of consumers to price signals. Demand response also provides capacity that can reduce load on peak days, in response, for example, to a decline in wind production during peak hours (see discussion of resource adequacy below). This demand response capacity could be offered to the ISO as ancillary services, including the possibility of providing regulation service from certain, appropriately configured demand response resources.

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While there is substantial demand response potential, the ISO is currently unable to tap its full capability in an effective and integrated manner. As a result, the ISO has a number of initiatives underway in cooperation with California state agencies, utilities, large consumers and demand response aggregators to improve this capability.<sup>24</sup> For example the ISO is proposing to implement a new demand response product, the "proxy demand resource", in addition to its participating load program, by summer 2010. This product would initially enable about 500 MW of demand response. The ISO's vision is to eventually provide mechanisms for demand response to participate fully in the wholesale market 24 hours a day, seven days a week.

Smart Grid

The smart grid refers to the integration of digital communication technology into all segments of the power sector, including generation, delivery, and consumption. These upgrades promise to improve system capabilities, including support for environmental policy objectives. Among other benefits, a smart grid will support the deployment of distributed generation such as rooftop solar photovoltaic systems, demand response and storage technology. Using advanced applications and automated control technologies, smart grid may facilitate the provision of ancillary services by demand response and storage resources. These capabilities could be significant, especially with potential contributions from a future fleet of plug-in hybrid electric vehicles with smart grid-supported charge and discharge capability.

Though the smart grid is in its early stages of development, its potential to mitigate renewable generation variability is clear. The ISO views these developments as an important part of a long-term strategy for renewable energy integration. For example, the ISO is working on new concepts for optimum dispatch of energy storage and demand response resources to provide regulation service. One of the ideas is to provide forward forecasting from variable generation resources such as wind and solar and blend that with anticipated changes in system load. The result should be a control signal that moves energy storage resources for small changes in the system, then moves the hydro and thermal generation resources for larger changes and finally dispatches participating loads for large changes. The control concept might look like the following diagram:

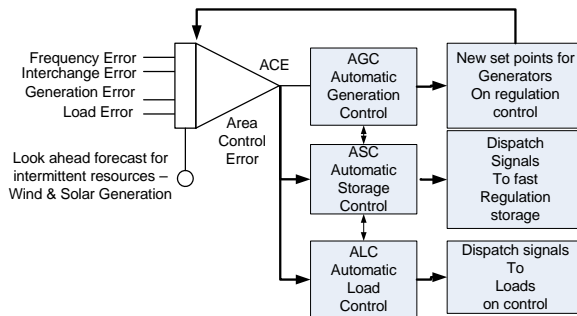
<sup>24</sup> Materials on the ISO Demand Response initiatives can be found at <http://www.caiso.com/1893/1893e350393b0.html>.

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The federal government recognizes the implementation of smart grid as a crucial step toward achieving energy policy goals. Two government agencies – the Federal Energy Regulatory Commission and the Department of Energy – are currently seeking to advance smart grid development.<sup>25</sup> The ISO has offered its comments to federal and state smart grid initiatives and is working toward clarifying its own role.

The smart grid, in addition to its role in renewable integration, will enhance grid reliability on a local and regional basis, decreasing the number of planned outages. It will also give consumers the ability to manage power costs by shifting their consumption from peak to off-peak hours. These developments will optimize statewide energy use, dampening load growth and reducing the need for investment in generation, transmission and distribution infrastructure.

<sup>25</sup> The Federal Energy Regulatory Commission's Proposed Policy Statement and Action Plan on Smart Grid Policy outlines its plan to adopt certain smart grid standards and set interim rate policy to cover related grid expenditures made before the Commission develops a complete policy. This kind of policy adjustment is necessary on the federal and state levels to craft appropriate incentives for smart grid research and deployment. The DOE's proposed web-based Smart Grid Information Clearinghouse will consolidate public technical, legislative and other information on smart grid development and practices. Its purpose would be to promote cooperation and coordination between all smart grid stakeholders.

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## 6) Renewables and Infrastructure Development

Achieving a 33 percent RPS will affect all aspects of the California and regional power system infrastructure. Moreover, these changes will be amplified by those driven by greenhouse gas emissions reductions, other environmental policies and the introduction of new technologies available for market and system operations. Most fundamentally, current policies and initiatives to develop the most cost-effective renewable resources rely heavily on high voltage transmission expansion to access those resources, most of which are located in remote areas. Identifying the right transmission projects to develop the best mix of renewables for cost and operational reasons will be the central challenge for the ISO and the state.

Infrastructure development must also address the need for non-renewable resources – especially the existing and new gas plants that will continue to provide energy and much of the increased operational requirements created by variable generation renewables. These plants play a key role in maintaining supply adequacy and local reliability over time.

This section begins with discussion of the ISO's role in developing and shaping generation infrastructure, including the resource adequacy program, the planned restrictions on plants with once-through cooling, and generation interconnection programs. Transmission planning is then examined, with a focus on the ISO's role in translating the Renewable Energy Transmission Initiative into a viable plan to achieve the 33 percent RPS.

### Resource Adequacy

In 2004, the State of California established a resource adequacy program to ensure that load-serving entities procure sufficient generation capacity to meet monthly peak loads plus a planning reserve margin.<sup>26</sup> Most resources within the ISO footprint that have a resource adequacy contract are obligated to make themselves available to the ISO, whether through a self-schedule or a bid into the ISO energy and ancillary services markets.<sup>27</sup> The ISO plays a role in the resource adequacy program by establishing capacity requirements for local capacity areas, primarily urban areas, which have a limit on the amount of power that can be imported during peak hours. The ISO also has the authority to "backstop" the program by procuring resource adequacy capacity in the event that load-serving entities fail to meet their obligations and also when conditions on the grid change – e.g., a significant transmission or generation outage – such that the ISO needs to position additional resource adequacy capacity in particular locations to ensure reliability. Resources that qualify to provide resource adequacy sell their capacity to load-serving entities through bilateral contracts, which sets the energy's value. The ISO

<sup>26</sup> The CPUC operates the resource adequacy program for its jurisdictional investor-owned utilities. The publicly owned utilities are subject to their own local reliability authority requirements.

<sup>27</sup> Limited energy resources, such as hydro, and renewable resources have special resource adequacy rules that exempt them from offering into the ISO day-ahead market.

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recently implemented rules for a standard capacity product that can facilitate trade in resource adequacy contracts.

A significant challenge under higher RPS is to establish the capacity value of variable generation in a manner that preserves the objectives of the resource adequacy program and system reliability. The particular concern is the summer peak hours when wind is typically operating at low output, which requires other capacity resources to be available. The ISO is working with stakeholders and the CPUC to develop a new approach to determining capacity values for wind and solar resources during peak hours.

### Once Through Cooling Regulations

Approximately 38 percent of California's in-state generation capacity (gas and nuclear power) uses water for "once through" cooling. Under a draft policy recently issued by the State Water Resources Control Board, these units will be required to reduce their impact on marine organisms. Depending on the provisions of the final rule, some plants may have to retire or repower in order to meet the new requirement.<sup>28</sup> Plants are located in local capacity areas and zonal areas, so the ISO needs to assess the reliability impacts (to the ISO controlled grid) from any such retirements. The ISO is currently working with representatives of the CPUC and CEC to develop a viable sequence for addressing once-through cooling requirements for particular units and local capacity areas. The ISO anticipates that future transmission studies reflecting the adoption of a water board policy will commence with the 2011 transmission planning process. The ISO also anticipates that the CPUC, as part of its Long-Term Procurement Plan proceeding will include measures to address any adopted water board policy to eliminate the impacts of once through cooling technology.

There are several linkages between once-through cooling policy and renewable integration. First, and most importantly, in addition to providing essential local reliability services in some cases, these plants also provide the ramping and regulation services needed for renewable integration. Thus, complying with once-through cooling regulations is yet another factor to consider in preparing the power system for higher levels of renewable resources.

### Grid Interconnection Process Reform

The ISO's generation interconnection process is intended to ensure that new generation interconnects to the ISO grid in reliable manner. To accomplish this objective, the ISO assesses grid impacts of new generation using a newly revised interconnection process. This also addressed a backlog of projects in the ISO generation interconnection queue by:

- Abandoning the prior serial project-by-project study approach in favor of one that groups geographically related generation projects to enhance processing efficiency;

<sup>28</sup> See [http://www.swrcb.ca.gov/water\\_issues/programs/npdes/docs/cwa316/draft\\_otcpolicy.pdf](http://www.swrcb.ca.gov/water_issues/programs/npdes/docs/cwa316/draft_otcpolicy.pdf).

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- Increasing the financial commitments and consequences throughout the interconnection process in an effort to realize more realistic outcomes that match system needs. In exchange, the new process establishes a "cap" on the interconnection customer's financial responsibility and, in doing so, addresses the cost uncertainty that inhibited investment under the under the prior serial study approach.
- Establishing an accelerated study process for those interconnection customers that are able to satisfy predefined criteria.

As a result of these reforms, 122 interconnection projects withdrew from the ISO queue. Nevertheless, the renewable capacity remaining in the interconnection queue for processing, as shown in the Table below, represents more than enough capacity to meet the 33 percent renewable goals. When the first set of grouped interconnection studies are completed later this year and companies' financial obligations significantly increase, the ISO expects additional projects to withdraw at that time. As these changes in the queue occur, it will be increasingly important for the ISO, state agencies, and stakeholders to understand the interaction between utility procurement, generation siting and the queue.

Generation Project - Fuel Type	# of Projects by Fuel Type	MW Capacity by Fuel Type
Biomass	4	85
Geothermal	10	502
Land Fill Gas	2	14
Natural Gas / Solar	1	150
Solar	88	30,291
Solar / Biomass	1	106
Wind	50	12,783
Water	2	540
<b>Total</b>	<b>158</b>	<b>44,471</b>

### The ISO Transmission Planning Process

The ISO transmission planning process is a well-defined set of analyses and procedures outlined in the ISO Business Practice Manual for the Transmission Planning Process.<sup>29</sup> Over the past few years, transmission planning has been increasingly oriented towards access to renewables, as illustrated by the recently CPUC-approved Sunrise project. With the advent of the large scale, multi-transmission line planning envisioned under Renewable Energy Transmission Initiative, the ISO and stakeholders may need to consider some tariff amendments to ensure cost-effective development of California and west-wide transmission infrastructure and integration of renewables into the California grid. In addition, as described in subsequent sections, the ISO is committed to working jointly with publicly-owned utilities and the investor-owned utilities to plan the appropriate transmission lines.

<sup>29</sup> See <https://bpm.caiso.com/bpm/bpm/version/0000000000000013>.

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### Renewable Energy Transmission Initiative

As noted above, meeting the 33 percent RPS goals will require a substantial amount of new transmission development, as most large scale renewable resources are located in remote areas. RETI is a statewide initiative designed to identify and quantify the renewable resources that can provide cost-effective energy to meet the RPS requirements, and also to identify the transmission investments necessary to ensure delivery of that energy to California consumers.<sup>30</sup>

The voluntary effort has brought together renewable transmission and generation stakeholders, regulators and ratepayers to identify, plan and establish a rigorous analytical basis for regulatory approvals of the next major renewable transmission projects. The Initiative's first phase produced a report outlining approximately 40 Competitive Renewable Energy Zones (CREZs) using a methodology including both economic and environmental protection factors. Phase 2 is ongoing, including a draft report issued June 3, 2009, that refined energy zones (now at 36, five of which are out of state) and also sketches out more than 100 conceptual transmission upgrades.

RETI plays a role of significant importance by helping the ISO balance the successful integration of the state's renewable initiatives with planning for a robust, reliable and cost-effective transmission infrastructure. The ISO believes this "balance" can be achieved by using the energy zones prioritization to inform the ISO's 2010 Transmission Study Plan. The objective is to identify the need for specific transmission upgrades that will enable load serving entities to meet the 33 percent RPS goals (see Box 5 for an initial conceptual assessment by the ISO).

#### Box 5. Conceptual Transmission Planning for Renewables up to 33% RPS

Transmission planning to support renewable development in California will be a multi-year effort. A first phase in conceptualizing the routes and cost of possible transmission projects was the Report on Preliminary Renewable Transmission Plans prepared by the ISO in August 2008 to inform the RETI process.

Significant additional transmission plans must be developed to achieve the state's 33 percent RPS goals. Based on preliminary assessment from various generation interconnection and transmission project plans, the report identifies six conceptual transmission projects that, if built and brought on-line by 2020, can help the state meet the 33 percent RPS and for several years beyond. These potential transmission projects, intended to connect and deliver renewable resources to the grid, are estimated to cost approximately \$6.5 billion (+/- 50% accuracy) in 2008 dollars. The report is available at <http://www.caiso.com/2007/2007d75567610.pdf>.



<sup>30</sup> RETI information can be found at <http://www.energy.ca.gov/reti/index.html>.

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### Options for Financing Renewable Transmission

The transmission infrastructure needed to facilitate the development of renewable resources may be identified through one of two interrelated ISO processes – the interconnection process and the transmission planning process, both of which are discussed above. The assignment of financial responsibility and the mechanisms for cost recovery for the added transmission facilities depend not only on the process in which it was identified, but also for the function the transmission facility serves. The Table above summarizes the financing options, including those specifically designed for renewable resource interconnection.<sup>31</sup>

As noted above and described in the Table below, in 2007, FERC approved a unique financial tool, the Location Constrained Resource Interconnection mechanism, developed by the ISO and market participants that breaks down barriers facing renewable power development. Renewable power is often located in remote areas without power lines to connect with the grid. Power plant owners are generally responsible for building radial interconnection facilities or "trunk lines" needed to connect to the high voltage transmission grid. Renewable power developers often found it difficult to secure the upfront financing necessary to construct such large interconnection facilities.

The financing mechanism removes this barrier by allowing the transmission owners to initially recover the costs of building a radial, renewable transmission facility from California ratepayers. The connected generators reimburse the cost based on their pro rata usage of the new facility. As more renewable generators are built and connected to the new facility, they will pay their share of the costs as well.

In May 2009, the ISO recently approved the first location constrained project. The Highwind-Windhub facility helps with the initial interconnection of approximately 759 MW in the Tehachapi area. The Highwind-Windhub project is scheduled to come on line December 31, 2010.

Other changes to the transmission planning and approval process may prove essential to facilitating the development of the transmission essential to meeting a 33 percent RPS. The ISO will continue to work with RETI, state agencies and stakeholders to address permitting challenges as well as other obstacles that become apparent.

<sup>31</sup> For more information, see CAISO Tariff Section 24 et al and Appendix Y and the Business Process Manual for Transmission Planning.

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Interconnection Process Type of Facility	Characteristics	Financing
Interconnection Facility	<ul style="list-style-type: none"> <li>Radial – power flows one direction</li> <li>Single Beneficiary</li> <li>Between generator and point of interconnection to transmission</li> </ul>	<ul style="list-style-type: none"> <li>Generator developer pays with no reimbursement</li> </ul>
Reliability Network Upgrade	<ul style="list-style-type: none"> <li>Transmission beyond point of interconnection</li> <li>Triggered by generator</li> <li>Remedy short circuit and stability issues</li> </ul>	<ul style="list-style-type: none"> <li>Financing costs assigned to generator developers, unless paid by transmission owner</li> <li>Full amount assigned to developer if studied individually</li> <li>Amount assigned to generator developer if studied in a group pro rata based on MW capacity of plant</li> <li>Upon commercial operation, Gen developer reimbursed either (1) through payments from transmission owner over 5 years or (2) through Merchant Congestion Revenue Rights</li> </ul>
Delivery Network Upgrades	<ul style="list-style-type: none"> <li>Transmission beyond pt of interconnection</li> <li>Triggered by generator</li> <li>Remedy thermal overloads or congestion</li> </ul>	<ul style="list-style-type: none"> <li>Financing costs assigned to generator developers, unless paid by transmission owner</li> <li>Assigned only to developers requesting Full Capacity Delivery Status (quality for resource adequacy)</li> <li>Full amount assigned to generator developer if studied individually</li> <li>Amount assigned to generator developer if studied in a group pro rata based on flow impact</li> <li>Upon commercial operation, Gen developer reimbursed either (1) through payments from transmission owner over 5 years or (2) through Merchant Congestion Revenue Rights</li> </ul>
Location Constrained Resource Interconnection Facility	<ul style="list-style-type: none"> <li>Radial – power flows one direction</li> <li>Connects two or more unaffiliated locationally constrained generators to pt of interconnection with transmission</li> <li>Locationally constrained generators located in Energy Resource Areas identified by the state</li> <li>Demonstration of commercial interest equal to 60% of the line's capacity</li> </ul>	<ul style="list-style-type: none"> <li>Financing costs assumed by the participating transmission owner</li> <li>Participating transmission owner files a tariff rate to recover cost of line on a pro rata basis from generators as they come online</li> <li>Any costs unrecovered after assignment to generators included in transmission owner's transmission revenue requirement and recovered through CAISO Transmission Access Charge</li> </ul>
Transmission Planning Process Network Transmission Facilities	<ul style="list-style-type: none"> <li>Determined by the CAISO to be needed for: <ul style="list-style-type: none"> <li>Reliability – specific NERC/WECC standard violation</li> <li>Economic Efficiency – value to CAISO ratepayers or Merchant Transmission Facility</li> <li>Preserve Long-term CRRs</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Financing costs assumed by participating transmission owner (in whole or in part depending if joint project with non-PTO) with cost recovery through CAISO Transmission Access Charge</li> <li>If Merchant Transmission Facility, financing from project developer with reimbursement solely based on revenue received by developer through receipt of Merchant CRRs Congestion Revenue Rights.</li> </ul>
Location Constrained Resource Interconnection Facility	See above	See above

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### Joint Planning of Transmission

With several entities engaged in grid planning and transmission development to access renewables in California and out-of-state, it is increasingly important to work from a jointly defined set of needs in order to plan most efficient system possible. To that end, the ISO, municipal-owned utilities and investor-owned utilities have initiated a planning coordination effort, called the California Joint Transmission Planning Group. This group is working together to identify transmission system expansions to meet the reliability, economic and renewable access needs of the state.

### 7) Regional Dimension of Renewable Development

California, the neighboring western US and Canada region have substantial opportunities for cost-effective renewable development if existing transmission capacity is used more efficiently and if transmission expansion is planned through effective regional coordination and cooperation. Development will also depend on policies such as the option of tradable renewable energy credits, as discussed above.

To advance these goals, the ISO is exploring opportunities for a better strategic alignment between the national energy agenda<sup>32</sup> and western regional policies, including the identification of Western Renewable Energy Zones.<sup>33</sup> The ISO will work with other sub-regional planning groups, the California Joint Transmission Planning Group and other planning authorities throughout the West on important regional planning issues in the coming months.

In addition to these regional planning efforts and the federal policymakers' interest in assisting the west with transmission planning, siting and cost allocation challenges, the ISO believes that there is some benefit to studying the operational impact of the western renewable portfolio standard targets in the aggregate. This analysis should also consider the effect on operations of greenhouse gas goals, such as those being developed within the Western Climate Initiative. The evolving policy and regulatory framework – at state, regional and national levels – should be consistent with sustaining a liquid power trading

<sup>32</sup> FERC, DOE and Congress are all seeking to advance regional transmission planning, permitting and cost allocation. The American Recovery and Reinvestment Act of 2009 (ARRA) directs DOE to help facilitate interconnection-based transmission plans for the East, West and ERCOT. \$60 million is set aside in the stimulus bill for funding related to preparation of these interconnection-wide plans, and DOE issued a "Funding Opportunity Announcement" (FOA) outlining criteria for awarding these funds on June 15, 2009. In the West, the Transmission Expansion Policy and Planning Committee (TEPPC) within the Western Electricity Coordinating Council (WECC) is likely to be the entity to coordinate development of an interconnection-wide plan.

<sup>33</sup> The Western Governors' Association and DOE initiated the Western Renewable Energy Zones process in May 2008, which emulates the California RETI process on a west-wide basis. Phase 1 of the process, the identification of the renewable energy zones, was completed in June and accepted by the governors' association at its annual meeting June 15. See Western Renewable Energy Zones (WREZ) Phase I Report, June 2009. Available at <http://www.westgov.org/wga/publicat/WREZ09.pdf>. The background documents contemplate that the conceptual transmission plans that would be developed following the energy zones identification would take place through "existing WECC and sub-regional transmission planning groups."

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market in the West. The ability to move power across the region becomes particularly important when considering the need to balance and firm variable generation. In general, policies and regulations to support renewable energy should retain sufficient flexibility for grid operators and market participants to engage in seasonal and geographic trades in the interest of optimizing power, costs and infrastructure.

Finally, the ISO believes that further development of the rules, procedures and products available in Western power markets can serve a key role in regional renewable integration. In particular, improved congestion management and rules for dynamic scheduling, pseudo tie arrangements, and intra-hour scheduling changes would promote renewable integration. Markets – including the ISO market – also expand the scope of available flexible resources for load-following and ancillary services to meet the integration requirements for regional renewable development.

## ATTACHMENT 7

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Building Division  
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Jim Eggert, Planning Director  
Planning Division  
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October 13, 2011

Mr. Dan Leavitt  
Deputy Director Planning/Environmental  
California High-Speed Rail Authority  
770 L Street, Suite 800  
Sacramento, California 95814

**RE: California High-Speed Train Project: Fresno to Bakersfield Section  
Draft Environmental Impact Report/Environmental Impact Statement**

Dear Mr. Leavitt:

On behalf of the City of Bakersfield (City), we are submitting this letter in response to the Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS) for the Fresno to Bakersfield Section of the California High-Speed Train Project (Project). We also acknowledge the notice issued by the California High-Speed Rail Authority (Authority) on October 5, 2011, that it intends to issue a revised DEIR/EIS in the Spring of 2012 that will re-introduce the Hanford West Bypass as an additional alternative alignment, along with an alternative station location to serve the Kings/Tulare region and other unspecified "improvements to the existing Fresno to Bakersfield alternatives." Please include this letter in the record of proceedings for the Project.

The City is a Coordinating Agency under the National Environmental Protection Act (NEPA), 42 U.S.C. section 4321, *et seq.*, and its guidelines, Code of Federal Regulations, title 40, section 15000, *et seq.*, and a Responsible Agency under the California Environmental Quality Act (CEQA), Public Resources Code section 21000, *et seq.*, and its guidelines (CEQA Guidelines), California Code of Regulations, title 14, section 15000, *et seq.* As such, the City takes its responsibility to participate in the environmental review of the Project very seriously.

The DEIR/EIS indicates the Project would have significant construction and operational impacts on residents of the City and surrounding communities that would permanently affect the physical environment and quality of life in the region. The nature and extent of the Project's significant environmental effects compelled the City to expend considerable resources in its review of the DEIR/EIS. During the unreasonably short period of time allowed by the Authority for reviewing and commenting on the Draft EIR/EIS, the City retained experts and directed City staff to evaluate the adequacy and completeness of the DEIR/EIS. The specific environmental issues identified in the comments enclosed as Attachment 1 were prepared by staff from the

City's planning, public safety, economic/redevelopment, property management, public works and engineering departments, and by experts retained by the City in the fields of traffic and transportation, noise, air quality, and the legal requirements of NEPA and CEQA. The curriculum vitae of these experts, which establish their qualifications, experience and expertise to comment on their respective subjects, are enclosed as Attachment 2. (*Sierra Club v. California Dept. of Forestry & Fire Protection* (2007) 150 Cal.App.4th 370, 382 [comments by qualified experts constitute substantial evidence that EIR is inadequate].) The experience and expertise of the City staff also qualifies their comments to serve as substantial evidence of the numerous ways in which the DEIR/EIS fails to comply with the procedural and substantive requirements of NEPA and CEQA. (*City of Arcadia v. State Water Resources Control Board* (2006) 135 Cal.App.4th 1392 [comments of government officials on a project's anticipated environmental impacts on their communities constitutes substantial evidence that EIR is inadequate]; *City of Rancho Cucamonga v. Regional Water Quality Control Board* (2006) 135 Cal.App.4th 1377 [comments of agency staff constitute substantial evidence].)

After careful review, the City has concluded that the DEIR/EIS fails to fulfill NEPA's and CEQA's fundamental objective of informing the public and the decision makers of the significant environmental effects of the Project and either omits or defers the information and analysis necessary to mitigate the Project's devastating significant impacts. The defects and omissions identified in the City's comments clearly show the DEIR/EIS fails to comply with the fundamental requirements of NEPA and CEQA. The City agrees with the Authority's decision to revise and recirculate the DEIR/EIS and fervently hopes that the revised and recirculated document will remedy the obvious deficiencies and produce a document which complies with the requirements of NEPA and CEQA.

**GENERAL COMMENTS**

**1. The Initial Period of Time Allowed for Public Review and Comment Was So Unreasonably Short that it Precluded Effective Public Participation.**

The DEIR/EIS, including the appendices, reference material and previous environmental documents from which it tiered, comprised many thousands of pages of material. Despite the large volume of material and the enormous public interest in the Project and its potential impacts on the environment, the Authority allowed only sixty (60) days for public review and comment. This truncated review period was clearly unreasonable and effectively precluded any meaningful opportunity for informed agency and public participation.

Although the time allowed exhibited facial compliance with CEQA's minimum requirements, it clearly violated the Authority's duty to provide an adequate opportunity for public review and comment and to ensure informed public participation in the environmental review process. (14 CCR §§ 15086, 15087, 15201). Numerous concerned persons, including the City, requested that the Authority allow reasonable additional time for public review of the DEIR/EIS. The failure to allow a reasonable time for public review of such an unusually long and complex DEIR/EIS denied meaningful participation by interested agencies, organizations and individuals and violated CEQA's most basic objectives.

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On October 5, 2011, however, the Authority gave notice that it intended to prepare a revised DEIR/EIS in the Spring of 2012, which will be recirculated for public review and approval. Although it informed the public that "[t]his step will also afford additional time to review the information contained in the current Draft EIR/EIS," the notice also stated that the "formal comment period for the Fresno to Bakersfield section Draft EIR/EIS will still end on October 13, 2011." The ambiguity of the notice and the confusion it has created are contrary to the procedures for recirculation set forth in CEQA Guidelines section 15088.5.

The unreasonably brief period of time allowed for review of the DEIR/EIS has prevented the City and others from being able to digest and comment on much of the information contained in the DEIR/EIS and its related materials. The City's comments, which include the general comments below and specific comments prepared by the City's experts and staff in Attachment 1, necessarily discuss only some of the important environmental issues which have not been adequately addressed in the DEIR/EIS. Accordingly, the City reserves its right to submit additional comments in the future on the revised DEIR/EIS, including any and all unrevised portions of the original DEIR/EIS which it may contain.

**2. The Project Description Is Uncertain and Incomplete.**

The description of the Project is ambiguous and unstable because it fails to identify a proposed project and instead identifies several possible alignment and HMF alternatives, one of which will be identified in the Final EIR/EIS as the preferred alternative. This approach is contrary to NEPA, which considers the project description to be "the heart of the EIS" and requires the EIS to analyze a proposed project and alternatives. (40 CFR §§ 1502.14, 1502.16(d).) It also is contrary to CEQA, which considers an accurate, stable and fixed project description to be the *sine qua non* of a legally sufficient EIR. (*San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655-656.)

The DEIR/EIS's consideration of six alternatives, without identifying which is the proposed project, results in an ambiguous and unstable project description which precludes informed public participation. Although the multiple alignment alternatives give the Authority several options from which to choose, they prevent the public and responsible agencies from knowing which alternative is the "proposed project" to which they should devote substantive attention. By deferring identification of the preferred alternative until the Final EIR/EIS is prepared, the Authority effectively precludes informed public review and comment on the DEIR/EIS. The use of multiple alternatives with no designated project also obscures and frustrates the fundamental purpose of alternatives, which is to avoid or substantially reduce the proposed project's significant environmental impacts. Unless this defect is remedied, the consideration of an additional route in the revised DEIR/EIS will only exacerbate the defect. Accordingly, the revised DEIR/EIS must identify which alignment is the proposed "project" and which alignments are project alternatives, which are intended to avoid or substantially reduce the significant effects of the proposed project.

The failure to identify a proposed "project" may be due to the fact that the design of the Project has not reached a point that allows meaningful environmental review. In the City's experience, environmental review of a project is premature until the project design is at the 30% stage. The alignment alternatives in the DEIR/EIS are only at the 15% design stage, and there is only a hypothetical design proposed for the "potential" Kings/Tulare Regional Station. Both

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CEQA and NEPA require environmental review to begin only "at that stage in the development of an action when . . . the effects can be meaningfully evaluated." (40 CFR § 1508.23; 14 CCR § 15004(b).) The DEIR/EIS confirms that environmental review of the Project is premature with a number of critical studies not yet complete, the analysis of several significant impacts deferred, and many mitigation measures in only the early stages of formulation. The City encourages the Authority to use the additional time not only to prepare a revised DEIR/EIS, but also to prosecute the proposed design to a stage sufficiently complete to allow meaningful evaluation of the Project's significant environmental effects.

**3. The Analysis of the Project's Environmental Impacts Is Inadequate.**

NEPA and CEQA require the analysis of potential impacts to be "reasonably thorough." (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142.) The DEIR/EIS is inadequate because it frequently discusses environmental effects in only general terms and fails to quantify extent of the Project's potential impacts. (*Galante Vineyards v. Monterey Peninsula Water Management District* (1997) 60 Cal.App.4th 1109, 1122-1123.) The DEIR/EIS purports to be a project level EIR that provides "site specific detailed analysis." (DEIR/EIS, p. 5-1.) Instead, it deals largely in generalities and frequently fails to quantify the extent of the anticipated impacts. Without such specific information, the public and the decision makers cannot assess the severity of potential impacts or the adequacy and effectiveness of proposed mitigation measures.

The DEIR/EIS also is inadequate because many of the assumptions, analysis and conclusions regarding potential impacts are not supported by facts, data or other substantial evidence. NEPA and CEQA require a lead agency to explicitly reference the scientific and other sources which support the discussions, analyses and conclusions in an EIS. (40 CFR § 1502.24; *Te-Moak Tribe of Western Shoshone of Nevada v. U.S. Dept of Interior* (9th Cir 2010) 608 F.3d 592; 14 CCR § 15147; *Joy Road Area Forest and Watershed Assn. v. California Dept. of Forestry* (2006) 142 Cal.App.4th 656.) The discussion of virtually every potential environmental impact consists of conclusory statements which are not supported by any scientific data or other facts. Unless they are supported by substantial evidence, the assumptions, analysis and conclusions in the revised DEIR/EIS will be susceptible to a successful legal challenge.

**4. The Proposed Mitigation Measures Are Incomplete and Ineffective.**

NEPA requires an EIS to discuss mitigation measures "in sufficient detail to ensure that environmental consequences have been fairly evaluated." (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142.) CEQA also requires an EIR to identify specific mitigation measures that will avoid or reduce the significant impacts of a proposed project. (14 CCR § 15126.4.) Proposed mitigation measures must be sufficiently specific to ensure they are enforceable and effective. (*Vineyard Area Citizens for Responsible Growth, etc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412.) Vague, incomplete or speculative mitigation measures are insufficient under CEQA. (*Federation of Hillside & Canyons Assn. v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1260.) As succinctly stated in the CEQA Guidelines, "[m]itigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments." (14 CCR § 15126.4(a)(2).)

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The DEIR/EIS fails to comply with the basic requirements of CEQA for effective and enforceable mitigation. The discussion of mitigation measures in each section of the DEIR/EIS fails to identify mitigation measures with sufficient specificity to gauge their effectiveness and enforceability. Few, if any, of the recommended measures identify who is to perform the mitigation, what action is required, when the mitigation must be performed, or how it is to be accomplished.

Under NEPA and CEQA, an essential component of an adequate discussion of mitigation measures is an assessment of whether the proposed measures would be effective. (*South Fork Band Council of Western Shoshone of Nevada v. U.S. Dept. Of Interior* (9th Cir. 2009) 588 F.3d 718.) The DEIR/EIS is inadequate because it improperly defers the formulation of necessary mitigation measures. (14 CCR § 15126.4(a)(1)(B); *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 669-671.) In many critical areas, necessary mitigation measures or critical components of the measures are left for future determination. Where the mitigation measures are not identified and agreed on, the conclusion that impacts will be mitigated is unsupportable. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70.)

In addition, the DEIR/EIS repeatedly conditions the implementation of necessary mitigation measures with the words "where possible" or "to the extent feasible," which violates CEQA by improperly delegating the determination of whether or what mitigation will be performed to unnamed persons and making it uncertain whether the significant impact will or will not be mitigated to a level below significance. As a result, it is impossible for public and the decision makers to know whether the measures will be effective and enforceable. (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142; *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70; *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099; *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296.)

An EIR/EIS is required to evaluate feasible mitigation measures proposed by the public or responsible agencies. (14 CCR § 15126.4(a)(1)(A), (B).) The Authority undoubtedly will receive comments from other agencies and members of the public which propose feasible mitigation measures that may avoid or reduce the severity of the Project's significant impacts. The City requests that these mitigation measures be adopted and, if they are not adopted, that the DEIR/EIS explain the reasons for not doing so.

**5. The DEIR/EIS Did Not Consider a Reasonable Range of Alternatives.**

An EIR/EIS is required to analyze a reasonable range of alternatives that will fulfill the fundamental objectives of a proposed project and will avoid or substantially reduce any of its significant environmental effects. (40 CFR § 1502.14; 14 CCR § 15126.6.) Under CEQA, it is the lead agency's responsibility, not the public's or responsible agencies' duty to identify feasible alternatives. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 405.) The range of alternatives discussed in an EIR must be sufficiently broad that it "will foster informed decision making and public participation." (14 CCR § 15126.6(a); *Center for Biological Diversity v. U.S. Dept. Of Interior* (9th Cir. 2010) \_\_ F.3d \_\_.) The existence of reasonable but unexamined alternatives renders an EIS inadequate. (*Ibid.*)

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The DEIR/EIS fails to comply with NEPA and CEQA because it did not consider a reasonable range of alternatives and instead, except for the mandatory "no project" alternative, examined only minor variations in portions of the proposed alignment. The DEIR/EIS' failure to consider other alternatives that could avoid or substantially reduce any of the Project's significant impacts, such as an alignment that follows established transportation corridors (e.g., SR-99) or an alternative technology that would avoid or minimize one or more significant impacts (e.g., maglev), renders the analysis inadequate and incomplete.

**6. The Authority Must Provide Meaningful Responses to the City's Comments.**

NEPA and CEQA require a lead agency to provide meaningful responses to public and agency comments. (40 CFR § 1503.4; 14 CCR § 15088.) "Comment noted" is not a meaningful response. If a comment does not warrant further response, the lead agency is required to explain why, "citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response." (40 CFR § 1503.4(a)(5).) The lead agency's responses to comments must describe the disposition of all significant environmental issues raised in the comments and must provide detailed, reasoned, good-faith analysis of the issues raised. (14 CCR § 15088(c).) Conclusory statements unsupported by factual information are not an adequate response. (*Ibid.*) An EIS cannot ignore reputable scientific criticism. (*City of Carmel-by-the-Sea v. US Dept of Transportation* (9th Cir. 1993) 123 F.3d 1142.) Accordingly, reasoned, factually supported responses are particularly important where the comments are made by responsible agencies or by experts. (*Berkeley Keep Jets over the Bay v. Board of Port Commrs.* (2001) 94 Cal.App.4th 1344, 1367, 1371.)

The Project and its potential significant environmental effects are of enormous interest to the City and its residents. The general comments set forth above and the specific comment contained in Attachment 1 are based on the experience and expertise of City staff and the experts retained by the City to evaluate the adequacy of the DEIR/EIS. The City trusts that the Authority will fulfill its statutory duty to provide detailed, reasoned and meaningful responses to the numerous significant environmental issues raised in these comments.

**CONCLUSION**

The City is submitting these initial comments in advance of the revised DEIR/EIS in a good-faith effort to assist the Authority in preparing an adequate and complete assessment of the significant environmental impacts the Project will have in the Central Valley. The City looks forward to receiving a meaningful opportunity to review the revised DEIR/EIS and to providing additional comments on the entire revised DEIR/EIS when it is recirculated in the Spring of 2012.

The City appreciates the opportunity to provide these initial comments and trusts that the Authority will fulfill its duties as the Lead Agency to prepare and recirculate a revised DEIR/EIS that accurately, adequately and completely discusses the extensive adverse environmental impacts the Project will have upon the community.

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Lastly, members of the public have submitted comments regarding the project to the City Council either by mail or electronically. Since we do not know if these comments were also sent to the Authority, we have included those letters with this correspondence so that they may also be considered as formal comments on the DEIR/EIS (see Attachment 4).

Respectfully,

  
Jim Eggert  
Planning Director

Enclosures

cc: David Valenstein, USDOT Federal Railroad Administration  
Zachary Simmons, US Army Corps of Engineers

Mayor and Councilmembers  
Alan Tandy, City Manager  
Virginia Gennaro, City Attorney  
Raul Rojas, Public Works Director  
Rhonda Smiley, Asst. to City Manager  
Steve Teglia, Asst. to City Manager

**ATTACHMENT 4**

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Bakersfield City Council Members City\_Council@bakersfieldcity.us

I am a resident in the Bakersfield area and I am writing to you to inform you of some of the many concerns that I have about the High Speed Rail project as it is planned including:

I oppose the H.S.R. Authority ignoring our community leader's reasonable recommendations during the planning of the project and I oppose the Authority not giving adequate consideration to many recommendations that would mitigate numerous negative impacts that the project as planned will cause my community.

L005-144 I oppose the Authority's plan to destroy an unacceptable amount of Bakersfield City and surrounding area's infrastructure, homes, churches, businesses and schools by the Authority's plan to run the Rail project directly through the middle of our long established city. Our city corporation yard is affected. Our police garage is affected. Our oldest Bakersfield landmark - Bakersfield High School is affected. Our Robobank civic center is affected. Our Mercy Hospital is affected. I ask "is this any way to run a railroad?"

L005-145 The Authority does not have to destroy so much of our community. The authority could easily locate the rail alignment and station location somewhere outside the established Bakersfield community. Relocation of the station and rails outside our established neighborhoods would eliminate most if not all of the negative impacts that the Authority's current alignment plans will cause. As planned the project will destroy over 230 homes in our relatively small community. It will displace at least 700 residents, it will destroy between 110 and 280 businesses affecting between 800 and 1350 jobs and it will destroy between 7 and 8 churches all in our community. I believe that the religious freedoms that we are guaranteed by the Constitution of the United States will be violated by such unnecessary government heavy handedness. These are an unacceptable number of negative impacts caused to our Bakersfield community by the Authority's poor planning. This is to say nothing of the tax revenue, both sales tax and property taxes lost. The jobs that are to be lost will only put more burdens on the City to try to find meaningful jobs for these newly displaced workers.

L005-147 I currently oppose the project as planned due to the insufficient amount of funds that are available to effectively begin construction of the project and I currently oppose the project because the amount of funds that will be necessary to complete the project have been grossly underestimated as has been verified by numerous Economists and groups with expertise in this area. There is no way the Authority can build, maintain, and operate the system with the funding currently available to them. The Authority's plan that ridership will pay for the ongoing cost of operations seems totally out of line with reality again, as does their plan for the source of future funding, which is undetermined.

I hope you will agree with me that the lack of fore thought by the Authority only adds a severe burden to our City and many of its residents. I ask that you oppose the Authority's current EIR/EIS and send them back to the drawing board, as many of the other cities along their route have already done. I personally feel a vote of "No Confidence" is in order for this issue.

Respectfully Submitted,

Leslie (Les) Robison  
7313 Live Oak Way  
Bakersfield, CA 93308

To Jim Eggert.

L005-148

L005-149

*Sept 23, 2011*  
We Carl & Betty Matthews are emphatically opposed to the high speed rail project in our City. The environmental impact report is incomplete as they have not included us in it as well as many others. Our Church at 800 Butte & King St. sets where you plan to put tracks, and would be destroyed. We have owned this property since 1971 and was always a church since the 1930's. Please don't let this happen. We pray you will stand with us against the rail in Bakersfield.  
Sincerely Carl & Betty Matthews

4700 KAYLAW AVE.  
BAKERSFIELD, CA 93313

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

L005-150

These are the individual data forms for each building in an HASR, Historic Architectural Survey Report (aka HPSR, Historic Property Survey Report).

What we should be receiving is the entire HASR/HPSR with all the DPR 523 forms for Bakersfield, and in particular the complete set for BHS.

Without the HASR/HPSR and the DPR 523 forms it is impossible to determine by what rationale JRP determined any building either eligible or ineligible for the National Register -- which is the only purpose for completing the survey under Section 106 of the National Historic Preservation Act (NHPA).

The NIIPA is very specific about what has to be done to clear and/or condemn properties potentially to be razed under eminent domain.

The HASR/HPSR should also include a major narrative history of the campus based on ALL the data we supplied to JRP.

The Draft EIR/EIS provides the briefest of summary references or charts, only denoting Harvey Auditorium as eligible for the NRHP.

CONCERNED BAKERSFIELD RESIDENT  
AUGUST 19, 2011

**Jim Eggert**

**From:** Michael Kennedy <mikeakennedy@gmail.com>  
**Sent:** Sunday, September 11, 2011 1:00 AM  
**To:** Jim Eggert  
**Subject:** High-Speed Rail EIR

Mr. Eggert:

L005-151

We have recently been notified by a grassroots movement that our Christian school (Bethel Christian School, Bakersfield) was not considered in our the High-Speed Rail Environmental Impact Statement/Report (EIS/EIR). However, it is clear that our school community will be significantly impacted even if our facility is not taken, via eminent domain, as the sound of the passing train, at 200mph, will disrupt the learning environment. According to United States Environmental Law, there is documentation required for such actions "significantly affecting the quality of the human environment".

L005-152

We are not asking the High-Speed Rail Authority to cease and desist. Instead, we simply request that the school (Bethel Christian School) be included in the Environmental Impact Statement/Report, as the existing EIS/EIR has managed to bypass the inclusion of our school during the planning phases. It makes no sense that a project of this size has not had to undergo a thorough assessment of potential impacts on schools. Even if the proposed high-speed rail does not come through our property the EIS/EIR should have included a sound barrier for the school and homes within the vicinity of the track/rail.

Michael Kennedy, Principal  
Bethel Christian School  
(661) 472-9649  
(661) 325-2661  
[mikeakennedy@gmail.com](mailto:mikeakennedy@gmail.com)

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Jim Eggert**

**From:** Becca Hill <jdzjane@hotmail.com>  
**Sent:** Monday, September 26, 2011 4:37 PM  
**To:** bakersfield mayor; zachary.m.simmons@usace.army.mil; Jim Eggert;  
fresno\_bakersfield@hsr.ca.gov  
**Subject:** High Speed Railroad in Bakersfield, CA

To Whom It May Concern:

L005-153

I am writing to you in response to the High Speed Railroad that is suppose to coming through Bakersfield, CA. It is my understanding that an Environmental Impact Report has been put together for the planned railroad. I also understand that my church, Full Gospel Lighthouse, will be affected by this plan. Full Gospel Lighthouse is planned for demolition. Unfortunately your Environmental Impact Report was not complete. The person(s) who put together your report left out Full Gospel Lighthouse church among many other homes and businesses. Full Gospel Lighthouse is located at 800 Butte Street in Bakersfield, CA. I know you are not from this neighborhood and to you its just another neighborhood. But this property is ordained by God to be a house of deliverance and has been for many people who attend the church and many in the neighborhood. This church has been a lighthouse - a source of light - sharing the gospel of Jesus Christ with this neighborhood. I have attended this church faithfully for the last 5 years. I found Jesus Christ my Lord and Savior at this church. I have received deliverance many times here at this church. The Spirit of God can be felt at this church.

I am opposed to the building of the high speed railroad in Bakersfield. I ask that another Environmental Impact Report be completed including Full Gospel Lighthouse and the surrounding community in it. I don't believe that the addition of a high speed railroad is going to benefit Bakersfield.

I thank you for your time.

Sincerely,

Rebecca J. Hill

A humble servant to the Most High God

**Jim Eggert**

**From:** The Hunny Do Handyman <thehunnydohandyman@gmail.com>  
**Sent:** Monday, September 26, 2011 6:11 PM  
**To:** bakersfield mayor; zachary.m.simmons@usace.army.mil; Jim Eggert;  
Fresno\_Bakersfield@hsr.ca.gov; City\_Council; district1@co.kern.ca.us; district2  
@co.kern.ca.us; district3@co.kern.ca.us; district4@co.kern.ca.us; district5@co.kern.ca.us  
**Subject:** High Speed Railroad Environmental Impact Report

To All Concerned,

L005-154

I am contacting you today in regards to the High Speed Railroad. I am requesting that Kern County and Bakersfield City reconsider allowing this project from continuing due to the underhandedness of the project. As you already know the EIR is incomplete and not explained in a simplicity as to allow the common man to understand it. This 30,000 page document can not be read in the amount of time being allowed to the majority of individuals who have only accidentally found out about their property being on the demolition slate or affected by the future of the HSR. I myself am a member of the church Full Gospel Lighthouse, and a board member, had to find out that our church is on the demolition list by an individual from the bay area only 2.5 weeks ago. We began to search out and dig in on all the information available to us by public record, as we have not received any other documents, only to find we were not included on the EIR. The EIR stops short of our address of 800 Butte Street Bakersfield, CA 93305, the report does not continue or take into account any part of the city beyond Baker Street and California Avenue. This is not proper or fair to the residents of Bakersfield, we have earned our right to be informed and to say no to the destruction of so many properties illegally and unconstitutionally. The law states that anyone affected by the HSR must be informed by a representative or a letter, and the EIR must be understood by the common man. This is not the case the 30,000 page document is written in such a way as to only allow a team of lawyers to decipher it and still not come to a unanimous conclusion on it's meaning. I am requesting that the EIR be re-submitted and re-examined to include all the properties affected by this poorly planned decision, or be dropped entirely.

L005-155

I understand that there is a "promise" of jobs and "better" business. I, along with many others do not see this as being the case. The HSR will only end up being a burden upon the tax payers and is a way to allow the business" of Bakersfield the opportunity to leave. The only people to be employed by the HSR will be foreign countries for materials, the lowest bidder and maybe some of the states unemployed. What happens when the construction phase is complete and we have wiped out so many existing jobs for the false "promise" of future jobs? There are plenty of empty parcels of land for the HSR to utilize. Why go further in debt trying to buy property already occupied? There are many questions that have been failed to be answered, and issues that need to be addressed. The economy as it stands today can not support this multi-billion dollar burden. I am not supporter of the amount of debt that California has incurred along with the Federal Government. If the average family was to try and incur this debt to scale the creditors would laugh at us and deny us before we can even begin to apply.

The HSR has done their job poorly, and intentionally at that, and should be made to hold the standards set forth for every other entity in California. If the state of California, County of Kern, or the city of Bakersfield continue to allow the citizens to be literally railroaded what sort of standard does this set forth for our children? You as our elected officials need to seriously re-consider the way this operation is being done. Please forward this email to all who may need to be included.

Thank you for your time it has greatly been appreciated.  
Jason D. Hill

I can do all things through Christ which strengtheneth me. Philippians 4:13

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Jim Eggert**

**From:** AdmMgr  
**Sent:** Monday, September 26, 2011 8:42 AM  
**To:** Jim Eggert  
**Cc:** Steven L. Teglia; Alan Tandy  
**Subject:** FW:

Jim - Another to add to your list and as we get these comments from , should reply back with an acknowledgement that we have received, etc. Thanks.

**From:** Stafford Betty [mailto:Stafford\_Betty@firstclass1.csuak.edu]  
**Sent:** Friday, September 23, 2011 6:45 PM  
**To:** DEVPin; AdmMgr  
**Subject:**

Dear Sirs:

I regard the high speed rail project as a massive boondoggle. I say this not because I don't like trains or am opposed on principle to high speed rail, but because the track between Los Angeles and San Diego, even if finished--and I don't think it ever will be--will never attract enough riders to make it pay. In England, Switzerland, and Austria, where I've traveled by train recently, a high percentage of the population use the rails, and trains run very frequently up and down the tracks--in England every five minutes. This is money well spent.

Rails work wonderfully in densely populated areas at close proximity to each other, but California's population is spread too far apart. Air travel makes much better sense, and it always will.

And of course there is the enormous expense, probably ranging realistically in the area of 150-200 billion. We don't have that kind of money. We never will.

Finally, the disruption of lives as homes, churches, schools, and businesses are destroyed is way too high a cultural and psychic price to pay.

Please stand firmly opposed to this wasteful project.

L. Stafford Betty  
Professor of Religious Studies  
CSU Bakersfield

**Jim Eggert**

**From:** melissa matthews <matthews5x5@msn.com>  
**Sent:** Wednesday, September 21, 2011 12:40 PM  
**To:** fresno\_bakersfield@hsr.ca.gov; zachary.m.simmons@usace.army.mil; Jim Eggert  
**Cc:** nadianaik@gmail.com  
**Subject:** Draft EIR/EIS Comment for High Speed Railroad through Bakersfield, CA

Greetings to all.

I am Pastor Todd Matthews of Full Gospel Lighthouse, 800 Butte St., Bakersfield, CA 93305.

This E-mail in regards to the High Speed Railroad that is proposed to go through Bakersfield, California.

In late August, 2011 I was contacted by a grass roots program that informed me that our property would fall in line with this High Speed Railroad project. After looking at some maps and reading through documents that they sent to us, it appears to me that this is correct. But what is also apparent is that the Environmental Impact Study did not include us and therefore is incomplete. To myself, the Board and the Members of Full Gospel Lighthouse this brings us great concern.

Here at Full Gospel Lighthouse, the Lord has blessed us in many ways. Just to name a few, our property is paid for and we operate debt free. The Lord has also blessed us in many ways enabling us to touch this community. We minister to the community in many ways such as Preaching, praying, feeding, clothing, and loving them. Our church is located in an area that is considered to be low income. It also has perhaps the greatest population of homeless and at risk adults in the Bakersfield area. We get out and help them each week by being Jesus' hands extended.

Speaking as a Pastor and a man of faith, this church and property at 800 Butte Street is what the Lord God Almighty has given us and through prayer and faith in Our Lord Jesus Christ, we intend on keeping it.

Thank you for your cooperation in this matter,

Pastor Todd Matthews  
Full Gospel Lighthouse  
800 Butte, St.  
Bakersfield, CA 93305

L005-156

L005-157

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Jim Eggert**

**From:** Edward Gonzales <egonzales55@gmail.com>  
**Sent:** Thursday, September 22, 2011 12:24 PM  
**To:** Jim Eggert  
**Subject:** Fwd: I Disagree with High Speed Rail Project

----- Forwarded message -----

**From:** Edward Gonzales <egonzales55@gmail.com>  
**Date:** Thu, Sep 22, 2011 at 12:21 PM  
**Subject:** I Disagree with High Speed Rail Project  
**To:** [CityCouncil@bakersfieldcity.us](mailto:CityCouncil@bakersfieldcity.us)

L005-159

This proposed route will destroy many established churches without any thought to its members or facts of origin in our faith and of leadership in this community.

**Jim Eggert**

**From:** City\_Council  
**Sent:** Tuesday, September 27, 2011 10:51 AM  
**To:** Jeff Taylor; bakersfield mayor; Couch, David; Couch, David; Harold Hanson; jacquiesullivan@sbcglobal.net; russjohnson77@yahoo.com; Selas, Rudy; sbenham@sbcglobal.net; Weir, Ken  
**Cc:** Brad Underwood; Jim Eggert; Steven L. Teglia  
**Subject:** ATTN: All Members please

Dear Mr. Taylor:  
Your e-mail has been provided to Mayor Hall, Councilmembers and staff. Thank you for providing input and sharing your ideas and concerns regarding the High Speed Rail project.  
Sincerely,  
Roberta Gafford, CMC  
City Clerk

**From:** Jeff Taylor [mailto:[californiafisherman@bak.rr.com](mailto:californiafisherman@bak.rr.com)]  
**Sent:** Monday, September 26, 2011 7:05 PM  
**To:** City\_Council  
**Subject:** ATTN: All Members please

Honorable Bakersfield Council Members,

L005-160

I am a resident and business owner within the Bakersfield community and I wish to inform you of the many concerns that I have about the harm that the High Speed Rail project as it is currently planned will cause our community.

I oppose the Authority's plan to unnecessarily destroy an unacceptable number of Bakersfield City and surrounding area's infrastructure, homes, churches, businesses and schools by the Authority's plan to construct the Rail project directly through the middle of our long established city. Our city corporation yard is affected. Our police garage is affected. Our oldest Bakersfield landmark - Bakersfield High School is affected. Our Robobank civic center is affected. Our Mercy Hospital is affected. Our city staff parking lot is affected.

The Authority does not have to destroy so much of our community to build their project. The authority could easily locate the rail alignment and station location somewhere outside the established Bakersfield community. Relocation of the station and rails outside our established neighborhoods would eliminate most if not all of the negative impacts that the Authority's current alignment plans will cause our community. It is worthy of note that the Authority's plan for the rail alignment in the Fresno area does not pass directly through their downtown community and due to that reasonable alignment; the project negatively affects far fewer citizens.

As planned the project will destroy over 230 homes in our relatively small community. It will displace at least 700 residents, it will destroy between 110 and 280 businesses affecting between 800 and 1350 jobs and it will destroy between 7 and 8 churches in our community. These are an unacceptable number of negative impacts that will be unnecessarily caused to our Bakersfield community by the Authority's poor planning.

L005-161

I oppose the H.S.R. Authority's common practice of not sufficiently informing property owners that their properties are at risk of demolition or value degradation by the project. I have never been informed by the Authority that my family residence is directly in the middle of their planned alignment. I have never been

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

L005-161 | informed by the Authority that my two business locations are directly in the middle of their planned alignment. I was informed of this by a citizen group located in the bay area on September 8th of this year. This notification was nearly halfway into the EIR/EIS review and comment period.

L005-162 | Local governments properly notify citizens of proposed zone change and conditional use permits to sufficiently inform the citizens where the zone change or C.U.P. properties are located in relation to the citizen's property. Proper notification provides the citizens an opportunity to be involved in the planning process. Proper notification was not given to the negatively affected citizens of the state concerning rail alignment locations. That omission has put the citizens of the entire state at a huge and unfair disadvantage because they were unable to be involved in the planning process of the project.

L005-163 | I oppose the Authorities plan to demolish as many as 8 churches, a religious school and a Hindu mission in our moderately sized community. I believe that our religious freedoms that are guaranteed by the Constitution of the United States will be violated by such unnecessary government heavy handedness. These are churches and schools that have been serving their community in long established neighborhoods. When they are destroyed, they will not be able to relocate in the neighborhoods that they serve.

L005-164 | I currently oppose the project as planned due to the insufficient amount of funds that are available to effectively begin construction of the project and I currently oppose the project because the amount of funds that will be necessary to complete the project have been grossly underestimated and the source of future funding is undetermined. I oppose the project because the unjustifiably high cost of the project will eliminate funding of important infrastructure projects well into the future.

The project has received a very small amount of Federal funds in relation to the amount of funding that will be necessary to complete the project. The project is located entirely within the state of California and it will be funded almost entirely by state of California tax payers. I believe that the Federal government has way too much power over this project. This is not an interstate project so I believe that it should NOT be managed by the Federal Railroad administration. The State of California should be in charge of this project because our California state leaders would better look after the best interests of their citizens.

The individuals working for the Federal agencies that are planning and managing the High Speed Rail project are accountable to no one in the state of California and they are unnecessarily harming the interests of Californians and a large number of the Bakersfield citizens that you serve. The Federally managed H.S.R. project has inexplicably exempted itself from our California Environmental Quality Act or CEQA standards and the Authority has ignored our California environmental standards as it drafted the project's EIR/EIS documents. These are environmental standards that all other projects located in the state of California are required to meet. The Authority's exemption of the project from our California state environmental standards is inexcusable. The Authority must be held accountable for this inexcusable omission.

Our state cannot afford this project. The Authority has planned this project in an extremely unethical and non transparent manner. I will never support a project that denies my fellow citizens their constitutionally protected religious freedoms by destroying so many of their neighborhood sanctuaries. I will never support a project that destroys our local culture and our community's quality of life. Our livelihoods, businesses, homes and city infrastructure are being threatened by the Authority's plan and I will not support those kinds of unnecessary negative impacts to our community.

L005-165 | The 3,300 page EIR/EIS documents are too voluminous, technically difficult and confusing for citizens to review and effectively respond to in the insufficiently brief 60 day review and comment period. I believe that the review and comment period should be extended to a more reasonable 6 month period.

2

L005-166 | Please do what is necessary to relocate the rail alignments to a less destructive location outside our established community. Please hold the Authority accountable for their uncooperative heavy handedness. Please protect our citizens from the unacceptably negative consequences of the High Speed Rail Authority's poorly planned project and please protect our citizens from the negative consequences that the Authority's poorly drafted EIR will cause our community.

Please consider proposing a vote of no confidence of the management, planning and EIR document preparation of the High Speed Rail Authority project at the next City Council meeting. Many other city governments throughout the state have done so. Your vote of no confidence will make an important statement of support of your community citizen's best served interests.

Respectfully Submitted,

Jeff Taylor  
1624 Country Breeze Place  
Bakersfield, CA 93312 (661) 332-1773

3

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Page 1 of 11

This is my comment on the Fresno to Bakersfield High-Speed Train Section Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS)

Date: October 10th, 2011  
My Name is: Jeff Taylor  
My address is: 1624 Country Breeze Place  
Bakersfield, CA 93312

I am a resident of and conduct business in the Bakersfield community. I wish to inform you of the many objections that I have about the California High Speed Rail Draft Environmental Impact Statement/Report for the Fresno-Bakersfield portion of the project. **It is my explicit understanding that I will have an opportunity to comment on the ENTIRE EIR in the spring when the Authority releases it.** I am alarmed by the harm that the High Speed Rail project as it is currently planned will cause my Bakersfield city and surrounding community.

**The High Speed Rail Authority did not inform property owners that their properties were at risk as they planned the project:**

The HSR Authority has not informed property owners that their properties are at risk of demolition or value degradation by the project. The official notification letter from the California HSR Authority that I received in mid August of 2011 was vague, deceptive, misleading and legally deficient in that it failed to indicate that my home would be subject to demolishment by the project. The issuance of such a misleading notification letter is contrary to the public good, the spirit of our democratic system, and it is an abuse of trust by persons in positions of authority. If I had relied solely on the August letter, I would not have been compelled to review and comment on the EIR/EIS documents and I would have suffered economic and legal standing damages. The high speed rail has committed errors and omissions in their dishonest notifications to property owners.

I have never been properly informed by the Authority that my family residence is directly in the middle of their planned rail alignment. Thousands of other property owners throughout the state have not been properly notified that their properties are at risk. I have never been properly informed by the Authority that my two business locations are directly in the middle of their planned rail alignment. Thousands of business owners throughout the state have not been properly notified that their businesses are at risk. This unethical and illegal practice has unjustly put the property owners of California at a huge disadvantage. It has prevented them from being a part of the HSR planning process and it has tricked them into not realizing the importance of their reviewing the EIR document and commenting on it within the 60 day review and comment period. I was informed about my property being at risk by a citizen group located in the bay area on September 8th of this year. *This notification was nearly halfway into the EIR/EIS review and comment period.*

Local governments properly notify citizens of proposed zone change and conditional use permits to sufficiently inform the citizens where the zone change or C.U.P. properties are located in relation to the citizen's property. Proper notification provides the citizens an opportunity to be involved in the planning process. Proper notification was not given to the negatively affected citizens of the state concerning rail alignment locations. *That error and omission has put the citizens of the entire state at a huge and unfair disadvantage because they were illegally shut out of the planning process of the project but more importantly, they have been denied their opportunity to review and comment on the EIR which puts the*

Page 3 of 11

**Prior to beginning construction of the HSR project, the government must assess the potential environment impacts under NEPA (Federal) and/or CEQA (State & Local) regulations:**

Pursuant to NEPA regulation (40 CFR 1500-1508), project effects are evaluated based on the criteria of context and intensity. **Substantial effects** would result in long-term physical division of an established community, relocation of substantial numbers of residential or commercial businesses, and effects on important community facilities. Pursuant to CEQA Guidelines, the project would have a **significant impact** if it would:

Physically divide an established community.

Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.

Relocate substantial numbers of people, necessitating the construction of replacement housing elsewhere.

Result in substantial adverse physical impacts associated with the provision of new or physically altered community and governmental facilities or with the need for new or physically altered community and governmental facilities, the construction of which could cause significant environmental impacts.

According to the EIR: "In the Northwest District, the BNSF Alternative would depart from the BNSF right-of-way just south of Rosedale Highway and rejoin the rail right-of-way after crossing the Kern River. The alignment would cut through an existing suburban development in Bakersfield's Northwest District. The rail alignment will *displace 239 homes, 282 businesses, and 7 churches including a Christian school and a Hindu Mission.* This alignment would alter community social interactions and community cohesion, and would change the physical character of our entire Bakersfield community. **These impacts would be substantial under NEPA and significant under CEQA."** See EIR at 3.12-S0.

"The Bakersfield South Alternative Alignment, like the BNSF Alternative, would pass through Bakersfield's Northwest, Central, and Northeast districts, affecting similar but somewhat different community facilities. Impacts in the Northwest District of Bakersfield would be similar to those identified for the BNSF Alternative, displacing many homes and several churches. Like the BNSF Alternative, *the Bakersfield South Alternative would divide the existing community displacing 228 homes, 109 businesses and 8 churches including a Christian school and a Hindu Mission.* This alignment would alter community social interactions and community cohesion, and would change the character of our entire Bakersfield community. **These impacts would be substantial under NEPA and significant under CEQA."** See EIR at 3.12-S2.

The Public Notice explains these effects will be felt in the following areas: "transportation, air quality, noise and vibration, electromagnetic fields, biological resources and wetlands, hazardous materials and wastes, safety and security, communities, agricultural lands, parks, recreation, and open space, aesthetics and visual resources, and cultural and paleontological resources." Clearly, under either alignment, the impact of the project will be particularly devastating to our local community. **The only possible mitigation to the multitude of unacceptably devastating negative impacts that the High**

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Page 4 of 11

*Speed Rail project will cause our Bakersfield community is to relocate the rail and station location to an area outside our metropolitan community.*

**The Authority's plan to destroy so many of our churches and religious schools deny citizen's our Constitutional right to practice our religious beliefs:**

The Authority plans to demolish as many as 8 churches, a Christian school and a Hindu mission in our moderately sized community. *The religious freedoms that are guaranteed every American citizen by the Constitution of the United States will be violated by such unnecessary government heavy handedness.* These are churches and schools that have been serving their community in long established neighborhoods. When they are destroyed, they will not be able to relocate in the neighborhoods that they serve. *The Authority is denying the Bakersfield citizens their constitutionally protected religious freedoms by destroying so many of our neighborhood sanctuaries.*

**The Authority has unlawfully exempted itself from California Environmental Quality Act or CEQA guidelines as the Authority drafted the EIR/EIS documents:**

The California High Speed Rail Authority was established in 1996 as a state entity. However, the Authority has inexplicably exempted itself from our California Environmental Quality Act or CEQA standards and guidelines. CEQA standards and guidelines are much higher and more detailed than the National Environmental Protection Act or NEPA guidelines and standards that the Authority has illegally adopted in its preparation of the project's EIR/EIS documents. The HSR project is not an interstate project; the project is located entirely in the state of California. *Therefore, the High Speed Rail project must follow the CEQA environmental standards and guidelines that all other projects located in the state of California are required to meet.*

**The EIR/EIS documents are poorly written and confusing:**

The Authority is considering two different rail alignments through the heart of Bakersfield. They were the "Blue" line and the "Red" line prior to the EIR/EIS document. The EIR now identifies the Blue line as the "BSNF Alternate" and the Red line as the "Bakersfield South Alternate" however in the documents that contain the rail profile maps, the routes are designated B1 and B2 and the maps that show impacted parcels are not even identified.

**The Authority irresponsibly provided insufficient hard copies of the EIR/EIS documents to the Bakersfield community for review purposes:**

*Only one hard copy of the 3,300 page EIR was provided for our community of 500,000 citizens to review which is malicious, irresponsible and insufficient.* There is one hardcopy EIR/EIS document available at the Beale Library in Bakersfield for citizens to review. Volume I is six inches thick (the biggest 3-ring binder I have ever seen). Volume II isn't much smaller. The third volume comprises six one inch plus thick books of maps. *The voluminous and complicated documents are too difficult to review and understand on a computer screen. Furthermore, many residents in our community do not have easy access to a computer.*

Page 5 of 11

**The description of the High Speed Rail project is incomplete:**

The EIR fails to describe the whole project. Without a description of all aspects of the project that could impact the environment, the EIR cannot be complete. The EIR fails to describe the electrical facilities necessary to operate the project including transmission lines to and from sources for the entire project including the stations. For this reason or reasons, it is not possible for the EIR to accurately and adequately describe the project's impacts and mitigation measures.

The EIR maps show two alternative routes in the Bakersfield community that abruptly end at Baker Street. The Authority plans to analyze the remainder of East Bakersfield in a future EIR. The City of Bakersfield, private property owners, citizens and business owners located beyond the current EIR study are put at a huge legal and economical disadvantage due to the Authority's incomplete, non specific and pathetically poor planning.

The Authority has not determined the rail alignment route from the southern San Joaquin Valley to the Los Angeles area. The Authority has not determined if they are going to construct their project over the Tehachapi Mountains to desert communities or over the Grapevine mountains to Los Angeles communities. The Authority has not completed environmental studies that are necessary to determine if it is even possible to construct the *high speed* rail project over the Tehachapi or the Grapevine Mountains.

The fact of the matter is that the HSR Authority has not even begun to complete the planning that is necessary to begin construction of the HSR project.

**The High Speed Rail Authority is conducting their business in an irresponsible, deceiving and dishonest manner:**

On the same shelf that the EIR/EIS documents were stored at the Beale library to be reviewed by the public, there was a stack of California HSR Authority Comment cards located next to the documents. On October 7th, 2011 all of the available HSR comment cards had the original comment period of August 15 to September 28, 2011. None of the cards had the yellow stamp on them informing citizens of the extended comment period date for the Fresno to Bakersfield HSR Train Draft EIR/EIS deadline of October 13. The librarian confirmed that these were the only comment cards that the HSR Authority had ever made available to the public. *Anyone wanting to use these cards to make a comment would be maliciously deceived into believing that the review and comment period deadline had passed and therefore would be discouraged into not submitting a comment.*

**The HSR Authority has not provided the EIR/EIS documents in Spanish language:**

This inexcusable omission has put the Spanish speaking public at a huge disadvantage. The omission has deprived Spanish only speaking citizens of their right to protect their economic and future legal standing by depriving them of an opportunity to comment on the EIR within the review and comment period.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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The EIR does not adequately offer effective mitigation measures to address the negative financial impacts to the property values of an unnecessarily large number of properties in the Bakersfield community:

The EIR does not adequately offer effective mitigation measures to address the negative financial impacts to property owners or city properties that will be forced to relocate City infrastructure, homes and businesses. The EIR does not adequately address the method by which the property owners that are forced to surrender their properties through the eminent domain process will be compensated.

The EIR does not adequately offer effective mitigation measures to address the extremely negative financial impacts caused by the project to community properties that will remain within sight and sound distance of the project.

The EIR does not adequately offer effective mitigation measures to address the extremely negative impacts to the property values of various properties that are designated within the alternate rail alignments for possible demolition, but have not yet been selected. The EIR as written unnecessarily puts many private property and community property asset values at risk.

The EIR does not adequately offer effective mitigation measures to address the negative impacts that the project will cause Bakersfield community's historically significant and culturally important community assets:

The EIR does not correctly identify SR-204 or Union Avenue as an historic resource. Caltrans has determined that Historic US 99 or SR 204 from Airport Drive to Brundage Lane meets the National Register of Historic places (NRHP) criteria. The California State Historic Preservation Office (SHPO) concurred with Caltran's determination and has agreed to add SR 204 to the Master List of State-owned Historical Resources. However, the EIR does not recognize SR 204 at Union Avenue as having sufficient historical significance to be considered in the report.

*The EIR does not adequately offer effective mitigation measures to address the destruction of Bakersfield High School's historically significant and culturally important buildings that are located north of 14th Street or offer reasonable and necessary mitigation measures to address replacement of the historically significant and culturally important buildings on a campus with very limited space.*

The EIR/EIS document does not offer effective mitigation measures to a multitude of problems that the project will cause our Bakersfield and surrounding community. Many of the mitigation measures offered in the EIR are vague and insufficient. Furthermore, *there are no possible effective mitigation measures for multitudes of excessively negative impacts that the project as planned will cause our Bakersfield and surrounding community:*

The EIR does not adequately offer effective mitigation measures to address the extremely negative visual character changing impacts that the project will cause a large percentage of Bakersfield and surrounding area citizens by the Authority's current plan to construct elevated rail structures as high as 80 feet directly through the heart of our established community. It is a fact that the extremely negative visual and aesthetic impacts that an elevated high speed train operation will cause the community cannot be adequately mitigated. *The visual change that an elevated rail system will cause to our Bakersfield community will be dramatic and not negligible as concluded in the EIR.*

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The EIR does not adequately offer effective mitigation measures to address the extremely negative visual impacts that the project will cause a large percentage of Bakersfield and surrounding area citizens from the huge amount of graffiti that the elevated rail structures and sound walls will undoubtedly invite. Necessary mitigation measures to address who will be responsible for removal of graffiti is not addressed in the EIR.

The EIR does not adequately offer effective mitigation measures to address the extremely negative noise impacts that the project will cause our Bakersfield community during and after construction. The noise that a high speed train will create as it travels 65 to 80 feet high will travel an unacceptably long distance from the rail location. The mitigation measures submitted to address noise in the EIR are insufficient, vague and in many cases deemed as being optional.

The EIR does not adequately offer effective mitigation measures to address the extremely negative vibration impacts that the project will cause to our community by the project's close proximity to remaining structures.

The EIR does not adequately offer effective mitigation measures to address the extremely negative hurricane force winds that a 220 mile per hour train will create. The dust that will be lifted by the vortex of the train will be substantial. However, no mitigation is offered. Effective mitigation measures to address Valley Fever and other pathogens that will be born into the air by the 220 MPH train have not been addressed. The rail alignment as planned will dissect many farm operations. Various pesticide, herbicide, fungicide and other harmful residues will be born into the air by the high winds created by the high speed train, but no effective mitigation has been offered.

The EIR does not adequately offer effective mitigation measures to address the increased traffic caused by the project on existing downtown Bakersfield city streets due to the HSR Authority's current plan to construct the rails and the station in the heart of our Bakersfield city. Increased emergency vehicle response times will also be caused by the added congestion but have not been adequately addressed in the EIR.

The EIR lists street names that do not exist and addresses that are not located anywhere near the proposed rail alignment, thereby drawing the entire document's accuracy into question.

The EIR does not adequately offer effective mitigation measures to address the elimination of a vital connector road on Palm Avenue. The Authority plans to dissect the Palm Avenue thoroughfare into two dead end cul-de-sacs. This will negatively impact existing traffic circulation in a large part of the surrounding community and cause negative impacts to response times for emergency services.

The EIR does not adequately offer effective mitigation measures to address the closing of Hayden Court and the negative impacts to all of the businesses along that street.

The EIR does not adequately offer effective mitigation measures to address the extremely negative impacts to our community's traffic circulation that will be caused during construction of the project.

The EIR does not adequately offer effective mitigation measures to address the destruction of available community parking for existing business and city buildings caused by the project or offer reasonable and necessary mitigation measures to relocate adequate parking availability.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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The EIR does not adequately offer effective mitigation measures to address the extremely negative impacts to our community's Bakersfield Commons project that is currently in the planning stages located on N.W. corner of Brimhall and Coffee roads.

The EIR does not adequately offer effective mitigation measures to address how the H.S.R. project as planned will destroy the City's corporation yard facilities or offer reasonable and necessary mitigation measures to address relocation of the Corporation yard facilities.

The EIR does not adequately offer effective mitigation measures to address the destruction of Bakersfield's Police department garage facilities or offer reasonable and necessary mitigation measures to address relocation of the Police garage facilities.

The EIR does not adequately offer effective mitigation measures to address the destruction of one half of the existing parking lot for city staff or offer reasonable and necessary mitigation measures to address replacement of the necessary parking.

The EIR does not adequately offer effective mitigation measures to address the negative impacts on Bakersfield's culturally important and economically significant Robobank convention center by the Authority's plan to destroy a large portion of the convention center's parking lot that is located South of the existing railroad tracks or offer reasonable and necessary mitigation measures to address replacement of the vitally necessary parking.

The EIR does not adequately offer effective mitigation measures to address the negative impact on Bakersfield's culturally important and economically significant Robobank convention center by the Authority's plan to destroy the loading area of the facility.

The EIR does not adequately offer effective mitigation measures to address the negative impact on Bakersfield's culturally important and economically significant Robobank convention center by the Authority's plan to destroy the pedestrian bridge from the parking lot to the convention center.

The EIR does not adequately offer effective mitigation measures to address the destruction of Bakersfield's Mercy Hospital's property or offer reasonable and necessary mitigation measures to address replacement of the Hospital property.

The EIR does not adequately offer effective mitigation measures to address the destruction of or the replacement of the Bakersfield City Credit Union.

**The EIR/EIS documents fail to adequately describe and characterize land use impacts:**

The EIR fails to describe the project's impacts on land use. In fact the EIR erroneously states that project impacts will be less than significant when taking into consideration the total percent of land impacted. *To the contrary, land use impacts will be significant.*

The EIR bases impacts on an unrealistically small project footprint. *The footprint will be considerably larger due to the height of the elevated rails, loud noise, vortex wind and vibration.*

The EIR underestimates land use impacts because it omits critical information about existing land uses and land use policies.

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The EIR does not adequately offer effective mitigation measures to address the projects disruption of existing neighborhoods and operations during and after construction of the project.

The EIR does not adequately describe the identification of negatively affected Bakersfield parks or bike paths within the projects massive footprint or offer effective mitigation measures to address the negative impacts that the project will cause to the public's use of the parks and bike path.

The EIR fails to adequately address or offer effective mitigation for the unnecessary destruction of over 2,200 acres of irreplaceable farm land.

The EIR does not adequately address or offer effective mitigation for the annual loss of hundreds of millions of dollars of farming revenue, dairy revenue, and other business revenue throughout the state that will be caused by the project.

The EIR fails to adequately address where the source of the massive amounts of electricity that will be necessary to power the HSR operations will come from.

The EIR does not adequately offer effective mitigation measures to address the overtaxing of the existing electric grid that the HSR operations will cause.

**The HSR project will cause numerous major impacts to Bakersfield TRIP projects:**

The HSR project will cause significant impacts to Bakersfield's Westside Parkway and Centennial Corridor project. There are significant conflicts with Bakersfield's TRIP projects currently under construction, as well as the future Centennial Corridor. If HSR adopts their EIR or plan alignments with such conflicts, it will create environmental document conflicts that would significantly impact the \$400Million extension of highway 58 - Centennial Corridor project.

Caltrans is currently preparing a Project Study Report, a Project Report and Environmental documents for the \$275Million Centennial Corridor Loop project. *The proposed HSR train alignments are in direct conflict with possible future direct connectors from Southbound SR-99 to Westbound SR-58 and from Eastbound SR-58 to Northbound SR-99.* The future direct connectors would be located east of the Mohawk Street interchange, passing across the BNSF rail yard, and tying into SR-99 near the Rosedale Highway Interchange.

**The HSR project will cause numerous major impacts to an important Bakersfield Redevelopment Project:**

The EIR does not adequately offer effective mitigation measures to address the project's excessive negative impacts to Bakersfield's new \$17 million South Mill Creek apartment project which is currently under construction. The South Mill Creek apartment project is an approximate 20-acre mixed use development which includes over 160 affordable housing units and approximately 100,000 square feet of commercial use. *According to the EIR document, all affordable housing in South Mill Creek will be permanently impacted by the project.*

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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The EIR document acknowledges that the City of Bakersfield has adopted redevelopment plans for the vicinity of Bakersfield's proposed HSR station but the EIR does not adequately address the direct negative impacts to the 160 unit South Mill Creek affordable housing project; nor does the EIR/EIS accurately address the economic impact on the redevelopment project as a whole.

**THE MULTITUDE OF EXTREMELY NEGATIVE IMPACTS THAT THE HIGH SPEED RAIL PROJECT WILL CAUSE OUR BAKERSFIELD COMMUNITY WOULD BE COMPLETELY ELIMINATED BY SIMPLY RELOCATING THE RAIL AND STATION LOCATIONS SOMEWHERE OUTSIDE OUR COMMUNITY. NO OTHER ADEQUATE MITIGATION MEASURES ARE POSSIBLE.**

The monetary cost of the High Speed Rail project is much more than the citizens voted for in the 2008 proposition-1A initiative.

In 2008, Proposition-1A advertised that the HSR project would cost \$33Billion and now it is estimated to conservatively require \$67 to \$87Billion to complete. Many highly respected economists believe it will cost much more than that. (See the September 14th, 2011 Economic report titled, "The Financial Risks of California's Proposed High-Speed Rail Project" by A. Enthoven, W. Grindley and W. Warren.)

In 2008, Proposition-1A authorized the state to sell bonds in the amount of \$9.95Billion to construct approximately 800-miles of high-speed rail track. Proposition-1A did not authorize the state to borrow an additional \$33Billion, \$67Billion or the 100's of Billions of dollars that the eventual cost of the HSR project may end up costing. The state does not have the required funds available to complete the Fresno to Bakersfield portion of the project and it has nowhere near enough funds to complete the entire project. This project cannot be completed as designed in today's economy and still have the required funds necessary to run the state.

In 2008, Proposition-1A advertised that the federal government would *probably* bear approximately 1/3 of the \$33Billion estimated total cost of the project or around \$11Billion. The federal government has only *conditionally* agreed to provide around \$5Billion dollars. However, the current estimated cost of the project has increased from the original \$33Billion price tag to \$67Billion. The federal government has never agreed to fund a third of this project and it is highly unlikely that it will.

If the state borrows \$9.95Billion and the federal government grants the state almost \$5Billion, there will only be approximately \$15Billion of construction funds available for the project which is still \$52Billion short of the estimated \$67Billion that will be required to build this project.

In 2008, Proposition-1A advertised that they expected private investors to fund approximately 1/3 of the \$33Billion or around \$11Billion. As of this date there are no private investors investing money to fund the project.

The interest on the \$9.95-Billion in state general obligation bonds will be paid out of the state general fund. The amount of funds available for vital services such as law enforcement and fire protection will be reduced. It is projected that the interest on the bonds will be \$10Billion over the next twenty years. After spending the Proposition-1A bond funds and the federal funds we will have invested approximately \$15Billion in the project. After paying back the principle and interest on the bonds we will have invested approximately \$19.95Billion in the project and we will still be missing more than

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\$52Billion to complete the project. For a cost of approximately \$20Billion, only *rails* will be constructed from somewhere south of Fresno to somewhere north of Bakersfield. Taxpayers will then be required to pay additional funds for electrification, trains, stations and maintenance facilities for the Fresno to Bakersfield section.

The HSR Authority now estimates that the section of rail from Fresno to Bakersfield will cost around \$13Billion to build. It is believed to be the *easiest* section of the project to build and the *least expensive* section of eight planned sections. *If the CHSRA is correct, the entire project will certainly cost much more than \$104Billion. Do the math...* (\$13Billion x 8 = \$104Billion) which does not include the \$10Billion State General Fund bond interest payments. These figures are in 2011 dollars; not the cost of construction 10 years from now. The cost for completing the project will be more, much more than we were initially promised.

Reasonable people must be concerned that this project is not and will not be adequately funded. At this point, I understand that the Authority has only obtained funding for constructing tracks for 80 miles. There are no funds allocated for trains, stations, maintenance facilities or electrification. Given the present fiscal climate, I don't feel that the State or the Federal government will be in a position to give away more money to the HSR project. Despite indicating the support of private investors, the Authority has not yet identified any particular firm commitments. I am concerned that this project will end up being a train to nowhere, much like Senator Stevens' bridge to nowhere in Alaska. The train will severely impact the citizens of Bakersfield without any long term benefit and it will add to the debt of the State of California.

The prospect of the High Speed Rail project ever paying for itself is realistically non-existent. The H.S.R. project will certainly be a huge economic drain to federal and state taxpayers.

The Federal Government is fiscally bankrupt and currently has a 14 trillion dollar deficit. The huge balance of funds necessary to complete the project will not come from the Feds. The state of California is also out of money and in fact has a huge budget deficit as well. Every county government in the state has a budget deficit. The selling of bonds for HSR construction will cost us untold \$Billions in interest.

The Authority has an insufficient amount of funds available to effectively begin construction of the project. The amounts of funds that will be necessary to complete the project have been grossly underestimated and the source of future funding is undetermined. Furthermore, the unjustifiably high cost of the project which is now estimated to be over \$116Billion will most likely cost over \$200Billion to complete. The huge cost of the project will eliminate future funding of more beneficial and important infrastructure projects well into the future.

End of comment

Thank you

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



## Chinmaya Mission Bakersfield

September 27, 2011

Fresno to Bakersfield Draft EIR/EIS Comment  
770 L Street – Suite 800  
Sacramento, CA 95814

Re: **Objection to the High Speed Railway**

Dear Sir/Madam:

With regard to the proposed implementation of a High Speed Railway system, I hereby submit this letter in opposition to this proposed project.

### 1. Introduction

I am a practicing physician in Bakersfield, California, since 1982. I have been very involved in the community;

1. Past Chief of Staff of Mercy and Memorial Hospitals.
2. Past President of Bakersfield Breakfast Rotary Club.
3. Past President of India Association of San Joaquin Valley.
4. Current President of Chinmaya Mission Bakersfield

### 2. Background on Church

At Chinmaya Mission, our goal is to provide to individuals, from any background, the wisdom of Vedanta and the practical means for spiritual growth and happiness, enabling them to become positive contributors to society.

Chinmaya Mission Bakersfield has been active in the community since 1995. We have weekly classes for our children which teaches them about the Hindu culture and heritage. We also have weekly Yoga, Meditation, and Adult Study classes which are open to all members of the community. A large number of Non-Hindus attend and participate in these activities. Chinmaya Mission Bakersfield consists of 300 families as our members. **Our building, located at 1723 Country Breeze Place, Bakersfield, California 93312, is in the path of the High Speed Railway and will be demolished if the project is to proceed as proposed by the California High-Speed Rail Authority. As a result, we respectfully oppose this initiative.**

1723 Country Breeze Place, Bakersfield, California 93312 • (661)588-0000

Fresno to Bakersfield Draft EIR/EIS Comment  
September 27, 2011  
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### 3. Environment Impact

Prior to taking action, the government must assess the potential environment impacts under NEPA (Federal) and/or CEQA (State & Local). Pursuant to NEPA regulations (40 CFR 1500-1508), project effects are evaluated based on the criteria of context and intensity. **Substantial effects** would result in long-term physical division of an established community, relocation of substantial numbers of residential or commercial businesses, and effects on important community facilities.

Pursuant to CEQA Guidelines, the project would have a **significant impact** if it would:

- Physically divide an established community.
- Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.
- Relocate substantial numbers of people, necessitating the construction of replacement housing elsewhere.
- Result in substantial adverse physical impacts associated with the provision of new or physically altered community and governmental facilities or with the need for new or physically altered community and governmental facilities, the construction of which could cause significant environmental impacts.

According to the EIR: "In the Northwest District, the BNSF Alternative would depart from the BNSF right-of-way just south of Rosedale Highway and rejoin the rail right-of-way after crossing the Kern River. The alignment would cut through an existing suburban development in Bakersfield's Northwest District, **displacing 122 homes and 10 non-residential properties, including a gas station/minimart, an art studio, 2 health centers, and 2 churches (Chinmaya Mission and Korean Presbyterian Church).** This alignment would alter community social interactions and community cohesion, and would change the physical character of the community. These impacts would be **substantial under NEPA and significant under CEQA.**" See EIR at 3.12-50.

Further: "The Bakersfield South Alternative Alignment, like the BNSF Alternative, would pass through Bakersfield's Northwest, Central, and Northeast districts, affecting similar but somewhat different community facilities. Impacts in the Northwest District of Bakersfield would be similar to those identified for the BNSF Alternative, displacing many homes and several churches. Like the BNSF Alternative, **the Bakersfield South Alternative would divide the existing community and result in a considerable number of residential property acquisitions in this neighborhood, as well as the displacement of churches (the Korean Presbyterian Church**

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Fresno to Bakersfield Draft EIR/EIS Comment  
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would be fully displaced and parts of Chinmaya Mission property would be displaced).”  
See EIR at 3.12-52.

The Public Notice explains these effects will be felt in the following areas: “transportation, air quality, noise and vibration, electromagnetic fields, biological resources and wetlands, hazardous materials and wastes, safety and security, communities, agricultural lands, parks, recreation, and open space, aesthetics and visual resources, and cultural and paleontological resources.” Clearly, under either alignment, the impact of the project will be **particularly devastating to our Mission and our local community**. So far, there has been no mention of compensation or noise abatement procedures available to those damaged by the project.

4. Additional Concerns

**First**, we are concerned that this project will not be adequately funded. At this point, we understand that the Authority has only obtained funding for **constructing tracks for 80 miles** - not for the actual trains or electrification. In addition, given the present fiscal climate, we don’t feel that the State or the Federal government will be in a position to give more money. Despite indicating the support of certain “private investors,” the Authority has not yet identified any particularized firm commitments. We are concerned that this project will end up as a “train to nowhere,” much like Senator Stevens’ “bridge to nowhere” in Alaska. The train will severely impact the citizens of Bakersfield without any long term benefit. It will add to the debt of the State of California.

**Second**, we believe the location of this project is misplaced. Currently, the proposed project will run through “old” Bakersfield, which will result in extreme traffic and parking congestion. Thus, we are concerned that local citizens will lose their easy access to downtown Bakersfield. Other cities, such as Denver, Colorado, have wisely chosen to relocate new transportation centers away from the downtown area, to avoid negative impacts, such as unwanted noise, vibrations, pollution, and traffic congestion. Notably, the proposed railway in Fresno, California does not pass through the center of the City and will affect FAR FEWER citizens.

**Third**, we find that the EIR report provided is incomplete and insufficient. For example, although the document provides data on environmental impact, the actual noise and vibration studies were not included. Without reviewing the studies themselves, it is impossible to decipher the relative impact of the project. Important considerations include: when the study was performed, how many trips per day were considered, the duration and location of specific testing sites, the effect of the Hageman/Allen underpass project, etc., thereby making it impossible to decipher the relative impact of the Authority’s project. In addition, the report does not address environment impacts on the East side, nor does it explain why the site on 7<sup>th</sup> Standard Road and State Route 99 was not considered. Furthermore, the EIR report is flawed because, at least in one section, it lists street names that do not exist and addresses that are not located anywhere near the proposed rail line, thereby drawing its accuracy into question.

Fresno to Bakersfield Draft EIR/EIS Comment  
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**Fourth**, we believe the Authority will not undertake the necessary procedures to mitigate adverse impacts on the community. In fact, we understand that mitigation efforts, such as construction of sound walls, are typically discretionary and, in some cases, can be reduced or even avoided altogether by the Authority. Thus, considering the budgetary constraints addressed above, we believe the community will not receive the necessary protections from the anticipated adverse environmental impact.

**Fifth**, we recommend that the HSR Authority re-evaluate the proposed site on 7<sup>th</sup> Standard Rd and Freeway 99.

**Finally**, we have not received adequate notice of the proposed project and respectfully request additional time of at least six (6) months to respond. In fact, the EIR includes approximately 30,000 pages of technical jargon, with which we are not familiar, and allows only a 60-day comment period. **To review it, we would have to read 500 pages a day.** The report is in highly technical language, being difficult for a layman to understand. It needs to be simplified. Further, we had no idea that our church would be demolished until receiving a phone call approximately two (2) weeks ago from a friend! The official notification letter from the California HSR Authority dated August 10, 2011, was vague, deceptive, and legally deficient in that it utterly failed to indicate that our building would be subject to demolition and potentially complete economic loss; reliance on this August 10<sup>th</sup> letter could have resulted in a substantial loss of our legal rights and damages. The issuance of such a misleading notification letter is contrary to the public good, the spirit of our democratic system, and an abuse of trust by those in positions of authority. Accordingly, we have already submitted a formal request for an extension to the Office of Governor Brown. Therefore, we feel an extension is necessary in this instance, and we kindly request your cooperation.

Thank you for your time and consideration.

Yours very truly,

**CHINMAYA MISSION BAKERSFIELD**

By:

\_\_\_\_\_  
Anil Mehta, M.D.,  
President

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**From:** Stacey Hungerford [mailto:shungerford@bak.rr.com]  
**Sent:** Wednesday, September 21, 2011 7:55 PM  
**To:** Sue Stone  
**Subject:** Fwd: High Speed Railway

Stacey

Begin forwarded message:

**From:** Anil Mehta <anilmehtamd@yahoo.com>  
**Date:** September 21, 2011 2:22:00 PM PDT  
**To:** undisclosed recipients :  
**Subject:** Fw: High Speed Railway  
**Reply-To:** Anil Mehta <anilmehtamd@yahoo.com>

Dear Fellow Meditators,

We need your help. See the following letter which was sent to our elected officials. If you can contact any members of the city council, Board of Supervisors, or State and Federal elected officials, please do so. That will help us a lot.

Anil Mehta

**Subject:** High Speed Railway

I am a practicing physician in Bakersfield and President of Chinmaya Mission Bakersfield, which consists of 300 families as our members. Our building on 1723 Country Breeze Pl is in the path of the High Speed Railway. As per the notice, our church building will be demolished for this project.

We, the citizens of Bakersfield, are strongly opposed to this project. It seems they do not have enough money to finish the segment that they are planning right now in the valley. With the present fiscal climate, we don't feel that the State or the Federal government will be in a position to give more money. This will end up as a "train to nowhere" just like Senator Stevens "bridge to nowhere" in Alaska. The train will severely impact the citizens of Bakersfield without any long term benefit. It will add to the debt of the State of California.

We would hence request you to use your influence to block this project.

Thank you,

Sincerely,

Anil Mehta, M.D.

**Jim Eggert**

**From:** City\_Council  
**Sent:** Monday, October 03, 2011 11:46 AM  
**To:** Couch, David; Couch, David; Harold Hanson; jacquiesullivan@sbcglobal.net; russjohnson77@yahoo.com; Salas, Rudy; sbenham@sbcglobal.net; Weir, Ken  
**Cc:** Brad Underwood; Steven L. Teglia; Jim Eggert  
**Subject:** FW: High Speed Railway

FYI...Roberta

**From:** anilmehtamd@yahoo.com [mailto:anilmehtamd@yahoo.com]  
**Sent:** Thursday, September 29, 2011 2:49 PM  
**To:** City\_Council; district1@co.kern.ca.us; district2@co.kern.ca.us; district3@co.kern.ca.us; district4@co.kern.ca.us; district5@co.kern.ca.us; bakersfield mayor; raywatson@co.kern.ca.us  
**Subject:** High Speed Railway

Below are excellent web to explain the High-Speed Rail project:

Against California High Speed Rail (Great Background)  
<http://againstcaliforniahsr.com/>  
Proposition 1A Text (2008 Voter's Guide)  
<http://voterguide.sos.ca.gov/past/2008/general/pdf-guide/suppl-complete-guide.pdf#prop1a>  
Legislative Analyst Office Report (May-2011)  
[http://www.lao.ca.gov/reports/2011/trns/high\\_speed\\_rail/high\\_speed\\_rail\\_051011pdf](http://www.lao.ca.gov/reports/2011/trns/high_speed_rail/high_speed_rail_051011pdf)  
Independent Peer Committee (Great Background)  
<http://www.cahsrprg.com/index.html>  
Independent Peer Committee Report (June-2011)  
<http://www.cahsrprg.com/files/legislativeanalysis.pdf>  
Peer Ridership Review Report (July-2011)  
<http://www.calhsr.com/wp-content/uploads/2010/02/PRP-first-report-final2.pdf>  
Assemblywoman Harkey (Great Background)  
[http://arc.asm.ca.gov/member/73/pdf/HSR\\_Compilation\\_Report\\_as\\_of\\_J.pdf](http://arc.asm.ca.gov/member/73/pdf/HSR_Compilation_Report_as_of_J.pdf)  
Californians Advocating Responsible Rail Design (Great Background)  
<http://www.calhsr.com/>

Eleven simple ugly financial things about the California High-Speed Rail Authority (CHSRA) and the high-speed rail project in California.

1- In 2008, Proposition-1A advertised that this project would cost 33-Billion dollars and now it is estimated to conservatively going to require 67 to 87-Billion dollars to complete. Many believe it will cost more than that.

2- In 2008, Proposition-1A authorizes the state to borrow 9.95-Billion dollars to build approximately 800-miles of high-speed rail track, not to borrow 33, 67 or even much more. The state does not have enough money on hand or the authorization to borrow the money needed to complete this project. This project cannot be completed as designed in today's economy with the money the state has to work with to run the state.

3- In 2008, Proposition-1A advertised that the federal government would probably bear approximately 1/3 of the 33-Billion dollars or around 11-Billion dollars. The federal government has only conditionally agreed to provide around 5-Billion dollars and the cost of the project has far increased from the original 33-Billion dollar price tag. The federal government recently experienced serious debates about his credit worthiness which makes it unlikely that the federal government will every fund a third of this project. The federal government has never agreed to fund a third of this project.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

4- Considering #1, #2 & #3, if the state borrows the 9.95-Billion dollars and the federal government gives the state the almost 5-Billion dollars, the state would have around \$15,000,000,000. \$52,000,000,000 short of the \$67,000,000,000 that they need to build this project. Many people believe that the cost will be much higher.

5- In 2008, Proposition-1A advertised that private investors would fund approximately 1/3 of the 33-Billion dollars or around 11-Billion dollars. There are no private investors yet and the cost projections of the project are now much higher than 33-Billion dollars.

6- The interest on the Proposition-1A 9.95-Billion dollars in state general obligation bonds will be paid out of the state general fund which will further reduce the amount of services such as law enforcement and fire protection the state can provide its citizens, unless, taxes collections and fees are increased. Note: counties are now being forced to house state prison felons to reduce the inmate population in the California Department of Corrections. It is projected that the interest on the bonds will be \$10,000,000,000 over the next twenty years. Note: if these monies are borrowed, spent and paid back, without much, much, more money being spent, only the track from Fresno to Bakersfield will be built.

7- Considering #4, #5 & #6, after spending the Proposition-1A money and the federal money and paying back the bonds, we will have invested 14.95-Billion dollars into the rail, at a cost of 19.95-Billion and we will still be missing more than 52-Billion dollars needed to complete the project.

8- Considering #7 and assuming that there are 30-million men, women and children living in California, they all each will have to pay \$665 dollars to build the Fresno to Bakersfield section (19.95-Billion divided by 30-Million). Since not all of Californians pay income taxes, the \$665 number will top \$1,000 for those who pay taxes. According to the CHSRA, you will not be able to ride the train until the next section is funded and built. When that is done, you will be able to ride the train for 83% of an airfare according to the CHSRA.

9- It is now estimated that the section of track from Fresno to Bakersfield will cost around \$13,000,000,000 to build. It is believed to be the easiest section of eight planned sections to build. If the CHSRA is right, the entire project should really cost more than \$104,000,000,000 (13-Billion x 8, 10-Billion dollars of State General Fund bond interest payments not factored). That is in 2011 dollars and not the costs of construction 10-years from now. It will be more, much more.

10- Considering #8 & #9, if the project is going to cost 114-Billion dollars to finish (9.95-Billion borrowed state dollars + 10-Billion state interest payments + 5-Billion federal dollars = 25-Billion dollars +/- combined with 89-Billion dollars of money yet to be determined from where or under what terms = 114-Billion dollars) divided by 30-million Californians puts every man, woman and child's share of the bill at more than \$3,800 by default. Since everyone does not pay taxes, the share to the tax paying citizen of California will top \$7,000, for an opportunity to ride the train for 83% of a plane fare. Those who do not pay taxes probably will not be able to afford to ride the train. Many who do pay taxes, will also not be able to afford to ride the train.

11- The CHSRA has spent more than \$630,000,000 to date on planning and they have not figured out yet that they do not have enough money available to build this project. Using CHSRA's current plan and mode of operation, this project cannot be successfully built. This is not a matter of whether or not you like the high-speed rail or not or whether you are a democrat or republican. There simply is not enough money committed to succeed and there is not enough money available to the state to do this without severely compromising the services it provides its citizens.

## ATTACHMENT 5

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



October 2, 2012

Mr. Jeff Morales  
Chief Executive Officer  
California High Speed Rail Authority  
770 L Street, Suite 800  
Sacramento, CA 95814

RE: Funding for Business Support Services

Dear Mr. Morales:

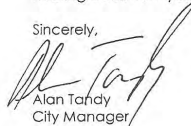
I want to, again, thank you for taking the time to meet with me in Bakersfield last week. As we discussed, while the City of Bakersfield remains opposed to the High Speed Rail project as it is currently planned, we appreciate your willingness to improve the direct line of communications with us going forward.

It is with great interest that we recently learned the Authority has entered into an arrangement with the City of Fresno to create a "Local High Speed Rail Business Support Services Program" with funding in the amount of \$4.6 million. In part, it appears that the program will pay for additional city employees to deal with the numerous complex issues that will affect Fresno area businesses as a result of the HSR project.

It goes without saying that businesses in Bakersfield will be placed in a similar situation. On that basis, it seems only fair and logical that the Authority should be offering the City of Bakersfield such funding for a like program to deal with the multitude of issues that will arise if the HSR project alignment runs through our community, as currently planned.

I earnestly hope you will take our request under serious advisement; we look forward to hearing back from you with a proposal for our consideration in the near future.

Sincerely,



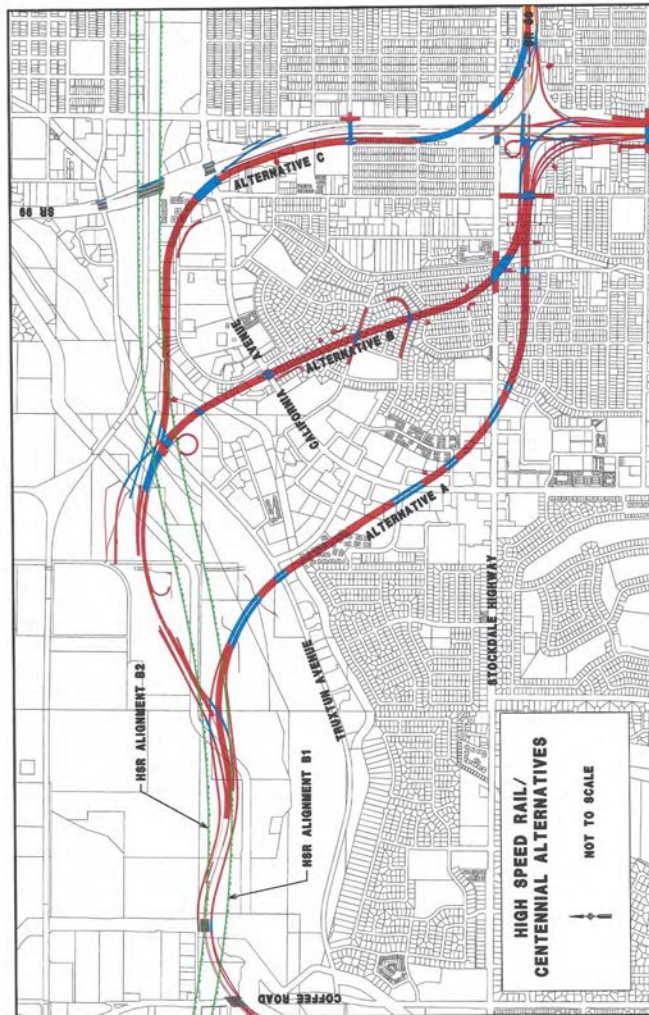
Alan Tandy  
City Manager

cc: Honorable Mayor and City Council  
Virginia Gennaro, City Attorney  
Douglas McIsaac, Community Development Director

City of Bakersfield • City Manager's Office • 1600 Truxtun Avenue  
Bakersfield • California • 93301  
(661) 326-3751 • Fax (661) 324-1850

## ATTACHMENT 6

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



CALIFORNIA HIGH-SPEED TRAIN PROJECT

STATEWIDE MULTIMODEL TRAVEL DEMAND MODEL  
DEVELOPMENT AND APPLICATION



## CALIFORNIA HIGH-SPEED RAIL RIDERSHIP AND REVENUE MODEL

DEVELOPMENT, APPLICATION, AND PROJECT-LEVEL  
EIR/EIS FORECASTS

November 2010

Prepared by



with Cambridge Systematics Inc.

For the California High Speed Rail Authority

PLEASE NOTE: This is a DRAFT version and not the final report. Several items are still to be resolved. In addition, while the following should be obvious from the text, it is stressed that the information and results presented in this appendix are estimates and projections based in part on subjective judgments, and will undoubtedly be materially different from the actual future ridership and revenue. As a result none of the outcomes and results in this appendix is in any way guaranteed or promised. The material presented in this memorandum was developed in order to estimate the environmental impacts of various high speed train service configurations. As such, growth forecasts, future transportation networks, and other significant items were required by state and federal environmental regulations to be based on officially adopted governmental plans, which were not independently assessed.

This document has been prepared by *Parsons Brinckerhoff* for the California High-Speed Rail Authority and for application to the California High-Speed Train Project. Any use of this document for purposes other than this Project, or the specific portion of the Project stated in the document, shall be at the sole risk of the user, and without liability to PB for any losses or injuries arising from such use.



Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Table 6- 4: Highest Station Boardings and Access Activity, 2035

Average Weekday\*

Origin Station	2035 Boardings			2035 Access Activity <sup>2</sup>												
	Inter-regional	Local	Total	Autos			Motorized Vehicles			Cumulative Rental			Transit/ Shuttle			Walkers Bicyclists Other Non-Motorized
				Dropping Off Pgrs	Arriving Pgrs	To Park	Dropping Off Pgrs	Arriving Pgrs	To Park	Demand	Brought Back	Dropping Off Pgrs	Aligning	Shuttle		
San Francisco**	29,400	11,000	40,400	3,300	2,900	9,800	1,600	2,300	10,300	1,600	2,300	10,300	11,200			
Millbrae	1,600	4,400	6,000	700	700	1,100	300	300	1,200	300	300	1,200	1,200			
Redwood City	4,700	3,100	7,800	1,100	1,200	3,000	400	400	800	400	600	800	1,000			
San Jose	8,700	3,900	12,600	1,200	1,400	3,600	600	600	2,800	600	600	2,800	2,600			
Glory	5,700	1,000	6,700	1,200	2,100	6,400	200	300	200	300	200	300	200			
Sacramento	19,100	0	19,100	1,600	2,700	9,000	900	1,100	4,400	900	1,100	4,400	4,000			
Stockton	6,700	0	6,700	1,000	1,500	6,600	300	400	600	400	600	400	400			
Merced**	7,600	0	7,600	1,200	2,200	7,700	400	600	600	400	600	400	300			
Fresno	8,400	0	8,400	1,300	2,200	7,400	400	400	700	400	400	700	400			
Bakersfield**	9,200	0	9,200	1,400	2,300	8,100	400	400	900	500	500	900	500			
Palmide	8,600	8,700	17,300	3,400	5,200	11,300	400	700	600	400	700	600	400			
Syrer	10,300	3,100	13,400	2,600	3,400	9,700	200	400	500	400	500	400	400			
Burbank***	2,500	4,300	6,800	1,000	900	1,900	400	300	700	800	800	700	800			
Los Angeles	14,100	15,000	29,100	2,300	2,900	4,800	1,200	1,400	7,500	8,300	8,300	7,500	8,300			
Nowak	4,000	3,000	7,000	900	1,300	3,100	400	400	800	900	900	800	900			
Archam**	25,400	5,100	30,500	2,800	5,000	13,700	1,600	1,700	6,200	6,200	6,200	6,200	6,200			
Ontario	5,600	3,400	9,000	1,600	2,600	3,800	400	400	1,000	1,000	1,000	1,000	1,000			
Reverend	10,000	3,700	14,300	2,500	3,600	7,000	700	700	1,800	1,800	1,800	1,800	1,800			
Temescal/ Murres	9,000	2,000	11,000	2,000	2,000	5,500	100	200	100	200	100	200	200			
Chico	6,000	300	6,300	1,200	1,500	5,000	500	500	1,100	1,100	1,100	1,100	1,200			
University City	6,000	200	6,200	1,200	1,700	6,600	100	200	100	200	100	200	200			
San Diego	19,900	400	20,300	1,600	2,200	7,200	1,000	900	4,300	4,300	4,300	4,300	4,000			
City of Industry	4,100	2,600	6,700	1,400	1,800	4,500	100	200	300	200	300	200	200			
Modesto	4,600	0	4,600	700	1,300	4,300	200	300	400	200	300	400	200			
Total Daily	231,200	77,200	308,400													
Annualization Factor	365	292	346	Forecast base												
Annual (millions)	84.4	22.5	106.7	* 12/2009 Full System for all stations except as noted												
				† Express is mirror of access												

\*\*\* Interregional from EIRIS Full System (08/2008) with changes due to parking cost estimated  
\*\*\*\* EIRIS Full System (08/2008) with changes due to parking cost estimated  
† Egress is mirror of access



Table 6- 7: Phase 1 Terminal Stations Boardings and Access, Full System 2030

Average Weekday\*

Origin Station	2030 Boardings			2030 Access Activity <sup>2</sup>													
	Inter-regional	Local	Total	Autos			Motorized Vehicles			Cumulative			Transit/ Shuttle			Walkers Bicyclists	
				Dropping Off Pgrs	Arriving Pgrs	To Park	Dropping Off Pgrs	Arriving Pgrs	To Park	Demand	Brought Back	Dropping Off Pgrs	Transit/ Shuttle	Other Non-Motorized	Walkers	Bicyclists	
San Francisco <sup>2</sup>	23,900	10,600	34,500	2,500	2,000	2,000	6,500	1,500	1,800	9,500	1,500	1,800	9,500	10,600			
Merced <sup>2</sup>	7,200	0	7,200	400	700	700	2,000	100	100	200	100	100	200	100			
Anahiem <sup>2</sup>	16,100	5,600	21,700	1,700	3,300	3,300	9,700	1,300	1,600	5,000	1,300	1,600	5,000	4,500			
				Forecast base													
																* Egress is mirror of access	

† Egress is mirror of access



Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Attachment 1 page 1

**ATTACHMENT 1**

**SPECIFIC ENVIRONMENTAL ISSUES/COMMENTS  
FRESNO TO BAKERSFIELD SECTION DEIR/EIS**

**GENERAL**

- The lead agency for the project is identified as the California High Speed Rail Authority, which was established in 1996 as a State entity (as defined on their web site). As such, we question why the draft document is not following the higher standards of the California Environmental Quality Act (CEQA) and CEQA Guidelines concerning format, specific identification of impacts, specific mitigation, overriding considerations, etc.
- The main EIR (Volume I) is over 1,500 pages. Overall, there are over 3,300 pages covering three volumes, plus reference documents and appendices comprising thousands of additional pages of material. For the entire metropolitan Bakersfield area (population approximately 500,000 people), only one hard copy of all of the EIR volumes and sections was provided for public review. This is insufficient and does not provide the public with adequate means to review the document. This is a lengthy and complicated report that is extremely difficult to review on a computer and a substantial portion of local residents either do not have access to or are not sufficiently proficient with a computer to be able to review the EIR and related materials. When considered in light of the extremely short comment review period, the result is that the public is being deprived of a meaningful opportunity to review and comment on the adequacy of the EIR.
- The existing 45 day comment period (later extended 15 days) is inadequate and denies due process to those seeking to comment on this EIR/EIS. In 2004, the public review period for the program EIR/EIS, which was a much more generalized document that only provided decision-makers with sufficient information to decide whether to continue with the process to pursue a high-speed rail system, was given a 180-day public review period. This EIR/EIS is a much more detailed and technical project level document, but was only given a 60 day review period. This is plainly insufficient to allow for any meaningful review by agencies affected by the project and the general public.

Although on October 6, 2011, the Authority released a public notice indicating that a revised DEIR/EIS will be released in Spring 2012 with its own 45-day review period, that notice states comments are still due on the initial DEIR/EIS within the original 60-day period. Furthermore, there is nothing stated in that release that the Authority will accept comments for the entire revised document or if responses to comments will be limited to just the revisions. Since the Authority's press release contains comments from Mr. van Ark and community elected officials that imply additional time will be given to adequately review the DEIR/EIS, it is presumed that means the entire document and not just the revisions.

- Both NEPA and CEQA state that an EIS and/or EIR shall be written in plain language and use appropriate graphics so decision-makers and the public can rapidly understand the documents. Additionally, the draft document should normally be less than 105 pages, and for proposals of unusual scope or complexity, may be up to 300

# ATTACHMENT 1

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Attachment 1 page 2

pages. This draft document is five times the recommended maximum. Its size and inclusion of technical discussions, and inclusion of technical engineering drawings are undecipherable to the majority of the general public. Further, although the EIR is many times longer than the recommended maximum, the Authority has refused to allow sufficient additional time for public review and comment. Allowing only the bare minimum 45 days for public comment, even with the additional 15 days agreed to by the Authority, is patently insufficient to allow for any meaningful opportunity to review and comment on the entire EIR.

- The City received public notice based on its ownership of impacted properties, which was identified by an Assessor's parcel number at the upper right-hand corner of the notice (note: some of these numbers were incomplete for proper identification). We presume that other individuals with impacted properties may have also received this notice and that these notices were sent only to those property owners impacted as identified in "Volume II - Parcels Within the HSR Footprint". However, there is no indication to the property owner why they are receiving the notice. The notice only states that the property owner, resident, or business owner is "in the project area" but this area is not defined. The map included in the notice provides no guidance since it shows the entire rail route between Fresno and Bakersfield at a scale that does not help the property owners determine if their property is truly impacted. There is nothing in the notice that states these properties are within the footprint of the HSR, or does it give any indication that the HSR directly affects their property or business. This is very misleading to those owners. We suggest that the notice be rewritten and resent to these affected property owners with better maps clearly indicating whether there would be a direct or indirect impact of the proposed rail to their property.
- There is no specific project description that includes the project's technical, economic or environmental characteristics to provide the basis for the discussion of environmental effects in accordance with Section 15124 of the CEQA Guidelines.
- The DEIR does not contain a discussion of the environmental setting that establishes the baseline physical conditions to determine whether an impact is significant. This makes it difficult to ascertain if significant environmental impacts were adequately investigated and discussed, and if meaningful mitigation is being proposed in accordance with Section 15125 of the CEQA Guidelines.
- Although the two routes are shown in Bakersfield, the EIR does not consistently identify them. In preliminary maps provided to the City and public prior to release of the EIR, the alternates were identified as "Blue" and "Red". In the EIR text these alternatives are identified as the BSNF Alternate (previous Blue) and Bakersfield South Alternate (previous Red). However, in Chapter 2 (Alternatives), it concludes that two alternates named D1-S and D2-N were being carried forward into the EIR evaluation, which we believe correspond to the BSNF and Bakersfield South alternates, respectively, but there is nothing mentioned in that section that establishes that correlation. In Volume III, which contains the alignment maps, these routes are shown as Alignment B1 and Alignment B2 (appears to correspond to BSNF and South Bakersfield alternates, respectively). In Volume II, which shows the HSR footprint maps, the alternates are not identified or labeled at all. Lastly, the proposed high speed train stations are identified as North and South Alternates, which would correspond to the BSNF and South Bakersfield alternatives, respectively (it would have been better served to identify

Attachment 1 page 3

these stations consistent with the alternative alignment names). To conclude, by not consistently identifying the alternative routes and corresponding stations, it makes it extremely difficult for the reader to follow a particular alternate through the analysis process and attempt to compare them with the maps contained in the other volumes. The inconsistent description of the project fails to comply with the basic CEQA requirement that an EIR provide "an accurate, stable and consistent project description. The failure to provide a stable and consistent description of the proposed project causes the EIR to be inadequate and requires the description of the project to be revised and recirculated for public review. See *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 197; *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655.

- In all early meetings with Authority staff, the City and public were provided maps showing the rail through the populated area from 7th Standard Road to Oswell Street. These maps also included the two alternatives beginning from where they split near Rosedale Highway to where they joined back together at Oswell Street. However, the EIR only shows the alternates ending near Baker Street. The remainder of East Bakersfield is stated to be analyzed in a subsequent EIR within the next one to two years. Furthermore, some maps in Volume III and the portions of the EIR (Socioeconomics) discuss at length impacts to East Bakersfield but no defined rail line maps or parcel information is available to fully evaluate potential impacts. This causes a couple of problems. First, in order for the City and public to fully understand and evaluate the EIR's impacts within the Bakersfield Metropolitan area, the study should have included the entire stretch of rail within the populated area. Property and business owners east of the station area are at a disadvantage since the two rail alternatives clearly show a continuation to the east. This continuation to the east will diffuse any cumulative impact discussion in the EIR. Secondly, any selection of an alternative west of the station cannot be made before the EIR for East Bakersfield is completed. The East Bakersfield property owners must be able to understand the potential impacts east of the station before they can have meaningful discussion on the entire alternative through the metropolitan area. The failure to include the entire stretch of rail in the East Bakersfield area causes the project description to be inadequate and incomplete, which in turn causes the entire analysis of potential impacts to be inadequate and incomplete. Please revise the EIR to describe the entire proposed alignment through East Bakersfield and analyze the potential impacts of the complete alignment. Once the EIR is revised, it would be recirculated in accordance with the CEQA Guidelines for public review and comment. See *San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 655; *Rural Land Owners Assn. v. City Council* (1983) 143 Cal.App.3d 1013, 1024.
- Although more detailed property maps should have been available to the public a very long time ago, there is no way to compare impacted properties of one alignment versus the other in the "Parcels Within HSR Footprint" volume. The maps show all impacted properties together. Therefore, it is not possible for someone to compare alignments and try to even support one over the other based on those impacts. Additionally, it is noted that some properties that probably should have been shown as impacted since the rail goes over/through them, show no impact at all (no color given).

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Attachment 1 page 4

- Since people will naturally migrate to the route maps, they will have difficulty finding the information about what the colors mean in any detail, especially if their property is shown as impacted. There is no detailed discussion in the EIR as to what these colors depict and what is actually impacted.
- The EIR/EIS does not adequately discuss nor address impacts to the City of Bakersfield's South Mill Creek Redevelopment Project. South Mill Creek, generally bounded by 'N' Street, California Avenue, 'S' Street and the BNSF railway, and adjacent to the described Bakersfield HSR station, is an approximate 20-acre mixed-use development which includes over 160 affordable housing units, and approximately 100,00 square feet of commercial uses on a former brownfield site. The EIR's failure to discuss potential impacts on the residents of these affordable housing units, including the sensitive receptors located there, renders the EIR inadequate and incomplete.
- Mitigation Measures (MM): Analysis text states that some mitigation may not be feasible because other jurisdictions have control over implementation of the MM. Therefore, these MMs are incomplete and inadequate.

Examples:

- a) Pg 3.1-6: the City of Bakersfield controls street intersections where HRS may not be allowed to change/improve. However, the MM does not state how HSTP will mitigate if the City does not allow access to the intersection. In addition, the EIR should identify and discuss other mitigation measures and alternatives that are within the jurisdiction of the Authority.
  - b) Pg 3.4-45; N&V-MM#3 (3rd bullet): is written to imply exterior sound barriers are not feasible, installation of building sound proofing (windows, insulation) would be adequate to mitigate interior noise.
- There is no mention of need for "Statement of Overriding Considerations" for those impacts that remain significant (Air, Noise, Traffic, Biological Resources, Aesthetics/Visual Resources, Cultural Resources)
  - The 2010 Federal Census shows that within the City of Bakersfield 45.5 % of the total population is of an ethnic origin that is Hispanic or Latino; for Kern County it is 49.2% of the total population. Many of these individuals may read, write or speak limited English. Because the Project impacts neighborhoods that contain high percentages of this ethnic group, the DEIR/EIS should have also been made available in Spanish.

### PURPOSE

- Page 1-27, Section 1.4.4 incorrectly states regarding the Bakersfield Thomas Roads Improvement Program (TRIP) that alternatives for the Fresno to Bakersfield HST Section in Bakersfield would overlap portions of the Centennial Corridor Alternative D between Mohawk Street and Union Avenue. Alternative D was dropped prior to the Centennial Public Update Meeting (May 2011) as a viable alternative for the Centennial Corridor Project.

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### ALTERNATIVES

- On page 2-27 under the Bakersfield Subsection, the discussion is totally inadequate under Section 15126.6 of the CEQA Guidelines. Rather than provide a range of reasonable alternatives to the project or to the location of the project, it discusses which alternatives were dropped from further analysis leaving just two routes within close proximity to one another. No maps have been provided to show the removed alternatives, nor are the remaining routes identified with the same names in the DEIR and maps thereby confusing the reader.
- Page 2-28 states that in 2003 the City of Bakersfield, along with the Kern Council of Governments and the County of Kern, endorsed the "Truxtun" downtown Bakersfield High-Speed Train (HST) station as the preferred alternative. However, the Truxtun station concept was preliminary at that time and was not accompanied by a proposed HST alignment. Furthermore, it was not known at that time that this station location would result in an elevated guide-way through downtown Bakersfield or that this station location would dictate what has become an essentially fixed HST alignment based upon the minimum design speed for express trains passing through, but not stopping in, Bakersfield. Furthermore, the extent of the impacts of the preferred alternative to established communities, businesses, institutions, and vital governmental facilities was not known at that time. For these reasons, it is imperative that a CEQA alternative consisting of an HST alignment which bypasses downtown Bakersfield, including alternative station locations, be included as part of the EIR analysis as a potential means to avoid or reduce the significant environmental effects of the project. Concepts considered to be desirable prior to the full evaluation of their environmental effects should not preclude the consideration of CEQA alternatives within an EIR which might be effective in avoiding or reducing significant environmental effects.
- On page 2-70, there is a general description of the two station locations, but there is no discussion or analysis as to their impacts upon existing development in the area.
- On page 2-89 under Section 2.5.3, Ridership and Station Area Planning, the second paragraph states that research suggests that the percentage of transit passengers arriving/departing transit stations by car and needing to park decreases as land use development and population around the station increases. This may be true for a typical commuter rail system, but the logic is flawed for a project that has been identified as an alternative to air travel with at least half of the trains not even stopping in the city. There are no facts supporting these statements. Parking and supportive transit services around the station will be significant, increasing congestion on the local streets. This will, in turn, increase vehicular exhaust emissions negatively affecting local air quality in the area. These issues are not discussed.
- On page 2-91, we question the statement that the "dwell time" at stations for passenger loading and unloading will only take 90 seconds. This figure seems incorrect.
- The no project alternative discussion is inadequate and fails to meet any of the requirements under Section 15126.6(c) of the CEQA Guidelines. Later sections (not all) sometimes include further discussion of the no project alternative relative to the environmental effect. However, this piece-meals the overall discussion making it

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Attachment 1 page 6

difficult to determine if the no project alternative is a relevant alternative. Furthermore, there are no facts provided to determine if the no project alternative is or is not environmentally superior.

- Page 2-93 states that "The HST will be most successful, and will best fulfill the intent of the voters and Legislature, if it is coordinated with sprawl-reducing and environment-improving land use development patterns. Accordingly, the Authority has adopted HST Station Area Development Policies based on the following premise: For the high-speed train to be more useful and yield the most benefit, it is important that the stations be placed where there will be a high density of population, jobs, commercial activities, entertainment, and other activities that generate personal trips." In our opinion, no basis exists for the Authority's assertion that these policies reflect the intent of the Legislature and voters in formulating and approving Proposition 1A. Despite the desire of the Authority to base route alignment decisions upon these policies, it is our opinion that an HST system would serve as an alternative to private vehicles, bus, rail, and air modes of transportation for intercity travel and, therefore, does not require stations to be sited within dense urban centers. Now that the project-level environmental effects of a downtown Bakersfield station and the resulting HST alignment are beginning to be realized, the time is ripe to evaluate the merits of the preferred alternative relative to potential alternatives. Instead, it has become increasingly apparent that the Authority's goal is to rush ahead to final engineering design and construction without the required analysis of feasible alternatives that take into account site-specific adverse impacts and without regard for the City's concerns.
- With respect to at least one preliminary alternative which would have avoided downtown Bakersfield but was rejected (Alternative 4), page 2-29 states that "This initial alternative was not carried forward for further consideration as it would not meet the project's purpose and need of providing a downtown station." However, nowhere within Section 1.2 of the EIR (Purpose of and Need for the HST System and the Fresno to Bakersfield HST Section) is it specified that the need for a downtown Bakersfield station has been officially established. To preclude the consideration of such an alternative in spite of the significant environment effects of the preferred alternative is contrary to the requirements of CEQA Guidelines Section 15126.6, including but not limited to subsection (f)(2) Alternative locations. Furthermore, CEQA is clear that an alternative is not infeasible simply because it may not meet one of the project's objectives. See *Mira Mar Mobile Community v. City of Oceanside* (2004) 119 Cal.App.4th 477.
- Page 2-93 states Proposition 1A mandated that HST stations "...be located in areas with good access to local mass transit or other modes of transportation." In Metropolitan Bakersfield, current and future planned mass transit consists solely of Golden Empire Transit and Kern Regional Transit bus and dial-a-ride services. Other modes of transportation in Metropolitan Bakersfield consist of private vehicles, taxis, and bicycles. The provision of good access from a Metropolitan Bakersfield HST station to local mass transit is not dependent upon a downtown station location. In fact, it is our belief that a significant proportion of HST system users in the Metropolitan Bakersfield area may be more likely to utilize the system if they are not required to travel to and, for those utilizing private vehicles and bicycles, to park for an extended period of time in the downtown area. Furthermore, with respect to bicycle accessibility, many areas of Metropolitan Bakersfield are more conveniently

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accessible to the Kern River Bike Path, a fully grade-separated bikeway which bisects the central portion of Metropolitan Bakersfield in an east-west direction, than to downtown Bakersfield.

- Due to the lack of guaranteed funding for extensions of the HST system beyond the Fresno to Bakersfield Section, travel demand and ridership forecasts should have been studied for a scenario where no future extensions beyond this initial section are constructed. By doing so, a comparison of the benefits versus the environmental effects of the project studied in the EIR would be possible, which is necessary in order for the Authority's decision makers to formulate a statement of overriding considerations, as required under CEQA, in conjunction with project approval. Alternatively, if the HST benefits are derived based on a full ridership Project Description, then the HST EIR should study the entire Project including the projected track through East Bakersfield as opposed to the piecemeal analysis which ignores potentially severe impacts to one of Bakersfield's more challenged urban locations.

**TRANSPORTATION**

- On page 3-2.8, Section 3.2 Transportation HSR incorrectly assumes that the daily trips are 4,590. That number of vehicle trips corresponds to the number of "Boardings," which is forecast to be 9,200 for the Bakersfield station. There are an equal number of "Alightings." Therefore the number of daily vehicle trips is twice what is indicated in Table 3.2.5. The assumed percentage of trips occurring in the peak hour is 15% and is too high. It should probably be closer to 10, or even 7 to 9 percent, consistent with auto peaking characteristics, instead of local bus peaking characteristics, which are typically 30% in the AM peak period and 30% in the PM peak period. The local transit peak hour percentages are a function of work and school trips being the prominent trip purposes for local transit trips. To really get the proper % during the peak hour, one should look at the diurnal distribution of traffic on I-5 and SR 99 for automobiles. The EIR must be revised and recirculated to correct the significant underestimate of vehicle trips for the Bakersfield station and the unsupportable percentage of trips allocated to peak hours.
- Caltrans in cooperation with the City of Bakersfield is currently preparing a Caltrans Project Study Report (PSR), and a Project Report (PR) and Environmental Document (EIR/EIS) for the Centennial Corridor Loop Project. This project, which will be adopted as State Route (SR) 58 immediately after construction, provides a continuous route along SR-58 from Interstate 5 (I-5) to Cottonwood Road on existing SR-58, east of SR-99. The proposed continuous route has been divided into three distinct segments. Segment 1 is the furthest eastern segment that would connect the eastern terminus of the Westside Parkway to the existing SR-58 (East) freeway. Segment 2 is composed of what is locally known as the Westside Parkway (WSP) and extends from Heath Road to Mohawk Street, and is currently under construction. Segment 3 extends from I-5 to Heath Road.

Three build alternatives (A, B, & C) are under consideration within Segment 1 of the Centennial Corridor. The proposed HST alignments are in direct conflict with Alternative C. This segment includes future direct connectors from Southbound SR-99 to westbound SR-58 and from eastbound SR 58 to northbound SR 99. The future direct connectors would be located east of the Mohawk Street Interchange, skewing across

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the BNSF rail yard, and tying into SR-99 near the Rosedale Highway Interchange. Estimated at \$275 million, the direct connectors are not included in the build alternatives at this time; however, the project cannot preclude the construction of these connectors in the future. Potential conflicts with HST, which must be addressed in the EIR and, where appropriate, resolved through design changes or mitigation measures, are as follows:

Alignment B1

- a. The HST vertical profile and the eastbound SR 58 to NB SR 99 connector vertical profile are proposed to be at the same elevation (approx. 475 feet). Elimination of the conflict would require a change in profile of 30 to 40 feet.
- b. HST alignment is proposed to be constructed directly above an active 6 to 8 lane freeway at an extremely high skew for potentially thousands of feet (Centennial scheduled to be constructed prior to HST).
- c. HST must span 6 to 8 lane mainline freeway plus approaches and auxiliary lanes to the future connectors.
- d. Outrigger placement will be critical. Freeway median cannot accommodate proposed columns for outrigger; thus, requiring widening of the freeway and encroaching onto railroad right-of-way.
- e. Temporary false work placement will impact active freeway for thousands of feet.
- f. Outrigger placement cannot preclude future widening of freeway. Current median width designed to accommodate future lane (possibly HOV).
- g. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).

Alignment B2

- a. The HST vertical profile and the eastbound SR 58 to NB SR 99 connector vertical profile are proposed to be at the same elevation (approx. 465 feet). Elimination of the conflict would require a change in profile of 35 to 45 feet.
  - b. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).
  - c. Centennial Project will construct off-ramp from westbound Centennial Corridor to Mohawk Street interchange. HST profile would possibly need to be raised to provide vertical clearance above off-ramp.
- Regarding the Westside Parkway, which is currently under construction west of SR-99, potential conflicts with HST, which must be addressed in the EIR and, where appropriate, resolved through design changes or mitigation measures, are as follows:

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Alignment B1

- a. HST alignment is proposed to be constructed directly above an active 6 to 8 lane freeway at an extremely high skew for potentially hundreds of feet.
- b. HST must span 6 to 8 lane mainline freeway plus interchange, approaches and auxiliary lanes already in place.
- c. Outrigger placement will be critical. Freeway median cannot accommodate proposed columns for outrigger without sacrificing future widening. Current median width is designed to accommodate future lane (possibly HOV) or a light rail facility.
- d. Temporary false work placement will impact active freeway for hundreds of feet.
- e. Construction activity may affect the commuters directly for extended amount of time with high cost and delays.
- f. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).

Alignment B2

- a. HST alignment is proposed to be constructed directly above an active 6 to 8 lane freeway at an extremely high skew for potentially hundreds of feet.
  - b. HST must span 6 to 8 lane mainline freeway plus interchange, approaches and auxiliary lanes already in place.
  - c. Outrigger placement will be critical. Freeway median cannot accommodate proposed columns for outrigger without sacrificing future widening. Current median width is designed to accommodate future lane (possibly HOV) or a light rail facility.
  - d. Temporary false work placement will impact active freeway for hundreds of feet.
  - e. Construction activity may affect the commuters directly for extended amount of time with high cost and delays.
  - f. Proposed HST equipment location may be in conflict with Segment 1 and Segment 2 (Westside Parkway).
- Page 3.2-33 states that the Golden Empire Transit District is operated by the City of Bakersfield. This statement is incorrect. It is a separate agency.
  - The attached Ridership and Revenue tables indicate the ridership and access modes by station, and the parking requirements at each station. On page 3.2-62 of the EIR/EIS, the document correctly indicates the parking requirement to be 7,400 spaces

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at the Fresno Station. On page 3.2-68 for Bakersfield, the document states, "The station parking areas would accommodate approximately 2,300 parking spaces at the Bakersfield Station." However, the attached table indicates the parking requirement at the Bakersfield station to be 8,100 spaces. Below the topic of Bakersfield Parking Impacts, Bakersfield Area Transit Impacts and Bakersfield Pedestrian and Bicycle Impacts are discussed. The volumes cited match those reported in the attached tables. So clearly the parking requirement is in error.

It is further noted that the attached tables indicate in a footnote that "Egress is mirror of access." This means that there are an equal number of passengers (and associated vehicle trips) de-boarding the trains and leaving the stations. The daily trips reported in Table 3.2-5 on page 3.2-8 are incorrect for several reasons. For Bakersfield, the attached tables note that 1,400 autos are dropping off passengers. Once the autos drop off the passengers, they depart the station. That is 2,800 vehicle trips. Additionally, there are 2,300 motorized vehicles arriving to park, 400 rental cars being returned, and 400 taxis dropping off passengers. These total 5,900 vehicle trips for the boarding passengers, not the 4,590 daily trips reported in Table 3.2-5. Plus there are an equal number of de-boarding related trips. Therefore, there are 11,800 daily trips for Bakersfield and 11,200 daily trips for Fresno.

- The Bakersfield Roadway Segment Impacts are discussed on page 3.2-66 and quantified on the following pages in Tables 3.2-21 and 22. In Table 3.2-21, Existing Plus Project scenario, there is virtually no difference between the "existing" and the "existing plus project" average daily traffic volumes. Some of these segments are incorrectly referenced so we cannot identify (SR 178 between 23rd Street and Chester Avenue, and 23rd Street between 24th Street and F Street). However, none of the 11,800 vehicles a day traveling to or from the station are apparently traveling along these segments. Under the Future with Project scenario, Table 3.2-22, it is easier to tell what roadway segment the authors are referencing. On 23rd Street, between F Street and Chester Avenue, not one extra vehicle will be on the roadway as a result of the HST station being constructed. It seems inappropriate to conclude that no one will want to use 23rd and Q Streets to get to the station. We did not further look at the individual level of service (LOS) results for the intersections, because with these ADT and station trip activity volume errors, the LOS results would not provide accurate or reliable data to base any conclusion. These errors alone are significant enough to warrant a re-study of traffic impacts.
- The City of Bakersfield, Greater Bakersfield Separation of Grade District, and the County of Kern, in coordination with adjacent property owners, have been engaged in defining Specific Plan Lines for the alignments and limits of grade separations along the BNSF Railway at Kratzmeyer Road, Renfro/Jenkins/Reina Roads and West Beltway. The addition of the High-Speed Rail alignment alternatives along the BNSF corridor has required the development of alterations to the previous concept plans for the railroad grade separations and necessitated an accelerated time schedule for construction of the grade separations along Santa Fe Way.

Santa Fe Way is a significant regional north-south route, connecting metropolitan Bakersfield with the cities of Shafter and Wasco. As discussed at the July 14, 2011 meeting, HSRA desires to run the High-Speed train under the recently constructed Seventh Standard Road overhead, adjacent to the BNSF Railway. This alignment

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would restrict future widening of Santa Fe Way to four lanes (currently planned as an ultimate six-lane arterial) and would necessitate the construction of a wall along the westerly abutment. It was determined that the loss in north-south roadway capacity could be mitigated with the construction of a parallel route comprised of Burbank Street, Zachary Avenue, the West Beltway/BNSF/High-Speed Rail/Santa Fe Way grade separation, and Heath Road.

The West Beltway is planned as an ultimate six-lane freeway. For that reason, the overhead should be constructed with a substructure for this ultimate facility and a superstructure for either two or four lanes. The connecting roadway should provide a minimum of two travel lanes and paved shoulders.

With respect to the proposed Reina Road crossing, the circulation plan calls for a southerly relocation of the crossing with connections to Renfro Road and Jenkins Road to provide a more efficient perpendicular crossing of the railroad and to provide for north-south circulation/travel. Your plans show a Reina Road crossing, they need to be corrected to the Renfro/Jenkins crossing. The design for the Kratzmeyer Road and Renfro/Jenkins/Reina Roads grade separations should provide for a minimum 55 M.P.H. stopping sight distances on the vertical curves. Both roadways are designated as six-lane arterial streets and therefore a six-lane substructure should be provided to allow for future widening. The superstructure on Kratzmeyer Road and Renfro/Jenkins/Reina Roads should provide for a minimum of four lanes and two lanes, respectively. The overhead structures also need to provide for a minimum of four travel lanes, bike lanes, and a median on Santa Fe Way, adjacent to the High-Speed Rail.

Because the preliminary design work and right-of-way coordination have been accomplished by our local agencies and adjacent land owners, we recommend that the Santa Fe Way mitigation project (Burbank Street grade separation, West Beltway overhead and connecting roadways), the Kratzmeyer Road grade separation, and the Renfro/Jenkins/Reina Roads grade separation be accomplished as early delivery projects. We also recommend that the full scope of these early delivery projects, including design, right-of-way acquisition, utility relocation and construction, be accomplished by our local agencies through a Joint Agencies Agreement among the HSRA, the City of Bakersfield, the County of Kern, the City of Shafter and the Greater Bakersfield Separation of Grade District, with funding being provided by the HSRA.

- Maps show that Palm Avenue in northwest Bakersfield will be permanently closed. This is a major collector road identified in the General Plan Circulation Element. No mitigation is identified as to where traffic will be directed and if this will result in other nearby roads dropping below level service "C" as indicated in the Plan. Closure is inconsistent with the policies of the General Plan.

### AIR QUALITY

- Section 3.3.1 Introduction - The introduction to the Air Quality Section is inadequate as it presumes that the HST project would have low potential of air quality impacts.

The analysis itself shows significant and unavoidable impacts. Additionally, the significant and unavoidable impacts on sensitive receptors is not adequately defined because the project description does not identify the source locations of the added

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generation needed for normal and emergency operations, it does not identify the locations of the sensitive receptors, it does not do a complete health risk analysis and it does not have an appropriate cumulative impact analysis for CEQA within the City of Bakersfield and surrounding urban areas. In general the following issues of concern should be extended to all discussions, quantifications and modeling in the EIR and the Technical Appendices.

- Section 3.3.3 A. Power Plant Emissions - The EIR inadequately represents the pollutant emissions (GHG, toxics and criteria) by using state averages which do not correspond to peak electrical demand of the HST.

The EIR assumes that all HST motive electricity is taken off the CAISO controlled grid and that the additional demand is met by statewide generation on an average basis. The current system has steadily experienced erosion of the in-state reserve capacity and does not have adequate reserve capacity for another 1000MW of demand. Therefore, the additional 1000MW must be considered as "new load" requiring added generation and the project must account for the added demand as being separate of the generation fleet used in the CARB Scoping Plan and related regulatory baseline. The demand for electricity must be followed by both energy and by capacity; otherwise the HST will not have a steady demand. Therefore the CAISO acting as the grid operator will have to call on additional generation to meet the transient load so as to maintain the appropriate voltage and frequency stability required by FERC and NERC. Any resultant increases in ancillary power costs due to increased transient demand within control nodes and penalties due to HST induced system failures may affect the CAISO and result in additional dispatch of high heat rate peaker generation.

The HST will be functionally equivalent to the addition of an entire city's worth of demand. The EIR should show evidence of contracts for the added electricity demand in terms of the actual demand profile or clarify in the project description to include those sources of electrical generation before making claims concerning the nature of the electric generation both in terms of emissions and location. The Central Valley is a tightly constrained and closed air shed and impacts due to new generation are not adequately addressed in the EIR.

- Section 3.3.3 A. Power Plant Emissions and Air Quality Technical Report: Section 6.7.3 - The EIR inadequately represents the criteria and toxic pollutant impacts and GHG effects by claiming use of RPS rather than peak load following generation needed to provide reserve capacity in the CAISO Control Area.

The EIR assumes that all HST motive electricity is taken off the CAISO controlled grid and that the additional demand is met by existing and planned statewide generation. The existing and planned generation (both RPS and traditional generation) are earmarked through the CPUC for the benefit of all ratepayers, who are responsible for paying the costs through rate making procedures. The current electrical system has steadily experienced erosion of the in-state reserve capacity and does not have adequate reserve capacity for another 1000MW of demand, whose costs both internalized and external are paid disproportionately by Central Valley ratepayers.

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The introduction of GHG initiatives such as RPS, Cap and Trade and the elimination of once-through cooling generation will reduce the availability of the non-renewables fleet upon which reserve capacity heavily relies. The EIR states that the HST will use "renewables" to derive the motive electricity but fails to account for the fact that all RPS is already nominated into the electrical system for the benefit of the existing sectors (i.e., industrial, commercial and residential). No one denies reasonable access to the grid but the cost of the additional demand in the context of emissions must be properly counted in the EIR, including Criteria Pollutant Costs as well as additional GHG allowances needed by the utility to provide the additional 8.32 GWh per day [HST EIR Air Technical Report, p.3.3-51], which by CARB schedule will have to come from a steadily reduced pool of allocation.

Mitigation should be required to offset the increments in terms of surplus real and quantifiable reductions in the affected air sheds or by protocols approved by CARB.

Further, the HST's potential use of renewable will be largely limited to solar generation since wind derived electricity is limited to night time when wind speeds reach sufficient velocity to achieve cut-in. Therefore, the additional 1000MW of actual demand created by the HST operations cycle must be considered new load requiring added generation, and the project must account for the added demand separate of the generation fleet used in the CARB Scoping Plan and related regulation. The EIR should show evidence of contracts for the electricity or clarify in the project description the sources of electrical generation before making claims concerning the nature of the electric generation both in terms of emissions and location. Any added generation needed to follow HST new load must be designed for the HST load profile and not rely on the state average heat rate. The resultant emission impacts should be based on the location of the new generation and not spread out to minimize impacts to the sensitive receptors. Although the train moves, the stationary electricity sources stay where they are and run at varying loads. Criteria pollutants are emitted in greater concentration at varying load conditions and GHG-related emissions per unit of electrical energy generated are much greater due to the inefficiency of part load operation. Simply put, the Central Valley is a closed air shed and impacts due to new generation due to the HST are not addressed in the EIR.

- Section 3.3.3 A. Power Plant Emissions and Operation Impacts: Emissions From Generating Facilities - The EIR inadequately presents the local impacts of the HST-related electricity generation by spreading the HST related pollutant emissions (GHG, toxics and criteria) over the entire state.

The reserve margin criteria for generation in the ISO control zones will dictate that new fossil-fired generation will have to be constructed to replace phased out once-through-cooling-based generation assets as well as to replace existing fossil-fired units that have now lost their capacity payments in previous Standard Offer Contracts and will shutter due to poor economic returns. Kern, Fresno, Tulare and Kings Counties are home to approximately 30% of the fossil-fired generation in the CAISO control area. Many of these new fossil-fired generation assets (needed to support the HST) will very likely be constructed in the San Joaquin Air Basin, particularly in Kern County.

The EIR states that "[b]ecause the regional emissions for the applicable pollutants are lower under the operational phase of the HST alternatives than for the No Project

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Alternative, only emissions generated during the construction phase need to be compared to these threshold values to determine whether the GC Rule is applicable." [p3.3-68]. This interpretation relies entirely on the assumption that there is excess capacity for the added electrical demand particularly in the renewable fleet. Progress data from the state's RPS conversion program and the resource availability trends do not support this assumption. This inadequacy, which understates the emissions impacts, extends throughout the air analysis.

- Section 3.3.5 and Air Quality Technical Report: Section 6.8 Construction Impacts - The EIR inadequately presents the local impacts of the HST construction pollutant emissions (GHG, toxics and criteria) in the San Joaquin Valley Air Pollution Control District (SJVAPCD).

The SJVAPCD has imposed very restrictive limits on new construction-related emissions. Presumably, the District board has been forced to take such measures to ensure continued Federal Highway Funding. Continued access to diminishing rights to emit indirect source emissions are a critical concern to all businesses seeking approvals to construct. The EIR did not quantify the HST compliance with Rule 9510 but instead appears to ignore the critical impact of its construction on the closed air shed and relies on an after-the-fact mitigation based on complying with ISR on an individual local-project-element basis, thereby avoiding any presentation of the acute or cumulative impacts until after the discretionary approvals are in place.

Additionally, the EIR does say that the construction emissions alone will impede progress of the San Joaquin Valley towards attainment with the federal air quality standards. No analysis of the indirect impacts to business and the public of not reaching attainment in accordance with the current plans has been discussed.

- Section 3.3.5, page 3.3-46 and Air Quality Technical Report: Section 6.8 Construction Impacts - The EIR inadequately presents the local pollutant emissions (toxics and criteria) impacts of the HST by not properly identifying the proximity to construction impacts by sensitive receptors in the City of Bakersfield.

The sensitive receptors which include hospitals, schools (both public and private), residences, convalescent homes, churches, and day care centers along the construction route have not been specifically identified either by map, table or any other means within the City of Bakersfield. Both CAPCOA and GAMQUL require the identification of location, and quantification of impacts to sensitive receptors, which include health risk assessment as well as criteria pollutant modeling at the project boundaries for the duration of the construction activities including demolition and construction. The concrete batch plants have no location specified, no equipment identified, and no sizing identified for the City of Bakersfield, which consists of largely elevated track. There are no construction staging areas identified within the City of Bakersfield which can also be areas of concentrated emissions. Given that this is a project level EIR, the project level EIR must specify all the project features so that the impacts associated with the complete Project Description can be identified and the public has adequate opportunity to comment. Both the SJVAPCD GAMAQI states that "CEQA requires that in evaluating the significance of a project's potential air quality impacts, the Lead Agency shall consider both primary (direct) and secondary (indirect) consequences. [CCR§15064(d)] Primary impacts include emissions from

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project construction and emissions...." Further, the CAPCOA Guidance Document states that "[a]lthough methodology for assessing health risk for construction projects is not included in this document, lead agencies under CEQA are required to identify health risk from construction activities or projects and mitigate if they are deemed significant." [CAPCOA Guidance Document, p7, footnote 4] This EIR does not quantify the construction health risk in and around the HST route passing directly through Bakersfield and its surrounding communities and reliance on ISR does not constitute mitigation for health risk at the project activity level.

- Section 3.3.5 and Air Quality Technical Report: Section 6.8 Construction Impacts - The EIR is inadequate as the construction impacts are significant and unavoidable without all feasible mitigations being implemented.

The proposed HST project could utilize the Voluntary Emissions Reduction Agreements as used in City of Bakersfield for large projects requiring all feasible mitigation for the emissions impacts. The mitigation has successfully reduced construction impacts to zero in this tightly constrained air basin. However, the analysis must still address the health risk at the site construction level and mitigations must be developed for these local construction activities to mitigate any site specific impacts as part of the conditions considered in granting discretionary approvals.

- Page 3.3-36 - The EIR is inadequate in that the health risk impact from the HMF is above the AB2588 standard of 10 in a million at the facility boundary.

AB2588 prohibits construction of any new stationary source that exceeds this threshold. An override of the AB2588 health risk protective standards should be discussed in detail. The override of the health protective standards will be precedent setting. This significant impact should have all feasible mitigation applied to achieve a level of no significant impact.

- Section 3.3.5 Project Operation Impacts and Air Quality Technical Report: Section 7.1.3 Airport Emissions - The EIR inadequately overstates the pollutant emissions (GHG, toxics and criteria) reduction from plane travel in Kern County based on removing 16 planes per day from Bakersfield to LA and San Francisco. The benefit should not be overstated. Presently, only 10 flights are scheduled.
- Section 3.3.5 Project Operation Impacts, page 3.3-52 - The EIR is deficient in the analysis of the operation of the HST station in the City of Bakersfield.

Emissions related to delivery of goods and services to and from the station were not quantified. No health risk related to the impacts of the sources of emission at the station was included. The indirect increased emissions at the City of Bakersfield wastewater treatment plant from the operation of the station were not quantified. See the previous discussion related to GAMAQI and the CAPCOA Guidance Document.

- EIR and Air Quality Technical Report - The EIR is inadequate in its analysis of the health effects of construction and operation of the HST.

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An exhaustive search of the EIR and Appendices did not reveal any consideration or discussion of Valley Fever. The EIR fails to consider the impact of fugitive-dust-related health effects from Valley Fever related to HST construction and operation. Valley fever has been a well-known concern in the Central Valley for many years, identified largely due to outbreaks among WWII trainees and prisoners. It is well documented that large scale projects such as the California Aqueduct and the construction of I-5 disturbed the soil and increased Valley Fever for both the residents and construction personnel. This impact has not been quantified nor discussed.

- Section 3.19 Cumulative Impacts, page 13 - The EIR inadequately analyzes the cumulative construction and operational impacts because the definition of critical project elements within the Project Description is not sufficient to support claims related to the project impacts either on a project level or in a cumulative context.
- Section 3.19 Cumulative Impacts, page 13 - The EIR inadequately analyzes the cumulative construction and operational impacts because the project presumes that a conformity analysis is sufficient using simple averages to dilute localized cumulative impacts.

The cumulative impact discussions do not include localized impacts of permitted but unimplemented and reasonably foreseeable projects, which have the potential to emit criteria, toxic, or GHG emissions. Without documentation or discrete analysis the EIR claims that all of the demolished structures are primarily "industrial" in nature and therefore no cumulative health risk analysis is necessary. Particularly in the City of Bakersfield the HST Project impacts thousands of homes, numerous schools, churches, and daycare centers, which the analysis ignores.

### NOISE

- Impacts to noise-sensitive receivers are identified as potentially significant after mitigation since there is no guarantee that noise barriers will effectively reduce operational noise to acceptable levels. Elevated guideways constructed through and adjacent to residential neighborhoods represent potentially significant sources of operational noise which likely cannot be fully mitigated. As stated above, a CEQA alternative which bypasses existing Bakersfield communities must be included as part of the EIR analysis as a means to avoid or reduce significant environmental effects, including but not limited to operational noise impacts. Another potential alternative which could avoid or reduce significant operational noise impacts is a below-grade system through established Bakersfield communities.

HST Project's train penetration into enclosed areas will have a significant localized pulse effect which has been identified in tunnel entrances for other existing HSR facilities. The EIR should carefully consider the use of barriers and analyze barriers in the context of low frequency resonance in the vicinity of sensitive receptors such as schools. [Proceedings: Low Frequency 2004, 11th International Meeting Low Frequency Noise and Vibration and Its Control, Maastricht, Netherlands.]

- Page 2-2 (2.2 HST System Infrastructure) states that "The HST System is envisioned as a state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology..." While it is acknowledged that voters who supported Proposition 1A

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envisioned a state-of-the-art, electrically powered, high-speed train system for California, it is not likewise acknowledged that such a system must utilize steel-wheel-on-steel-rail technology. Existing high-speed rail systems, as well as systems presently under construction throughout the world utilize various technologies, including but not limited to maglev, that have been proven to result in less severe noise impacts than conventional steel-wheel-on-steel-rail technology. Therefore, the inclusion of a CEQA alternative consisting of the implementation of a high-speed rail technology that is more advanced and, therefore, less environmentally damaging than steel-wheel-on-steel-rail technology is required.

- Section 3.4.3 A. What is Noise, Section 4.2.2 Measured Noise Levels, Noise and Vibration Technical Report: Section 4.2.2 Measured Noise Levels - The EIR is inadequate due to the fact that it does not properly portray the background conditions (soundscape).

The EIR Background Data are erroneously presented on an Ldn (Day Evening Night Sound Level) basis, which results in a smaller area of significant impacts than will actually exist.

The Ldn is the average sound level over a 24 hour period, with a penalty of 10 dB added to data for any given hour for the hours 22:00 to 07:00. This is not for application to background data; it is for impact analysis. Adding 10 dBA to any particular soundscape value based on evening implies that local background should be 10 dBA higher (one order of magnitude higher noise energy) during a given night-time hour.

The EIR correctly states in the definition in Section 3.4.3 A.: "Ldn: The Leq over a 24-hour period, with 10 dB added to nighttime sound levels (between 10 p.m. and 7 a.m.) as a penalty to account for the greater sensitivity and lower background sound levels during this time. The Ldn is the primary noise-level descriptor for rail noise in residential land uses."

The HST EIR's Noise and Vibration Technical Report states that in order "[t]o establish a base of existing environmental noise levels for project noise impact assessment, a comprehensive series of noise measurements were made within the study area. A combination of 196 long-term (24 hours in duration) and 207 short-term (60 minutes in duration) noise measurements were taken at noise-sensitive receivers. Some measurement sites included multiple measurements. The ambient noise level measurement locations were selected to be representative of the noise environment most likely to be impacted by train noise. Measurements were completed at single-family and multi-family residences for long-term measurements. Short term measurements were completed at residential and institutional sites (e.g., hospitals, libraries, schools, churches), and were taken to estimate the Ldn at receivers with sleep activity not covered by the 24-hour measurements and to determine the existing conditions at receivers with only daytime activities." Temph [4.2.2 Measured Noise Levels]. This argument for using either 24-hour or one-hour monitoring and the misleading application of Ldn adjustments to estimate a pre-existing soundscape described by an single inflated Ldn leaves the reader with no means of understanding how a train passing by in the evening, nighttime and early morning will affect their location. Simply, the Ldn adjustments should be used on the impact (not the existing

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soundscape) and compared to the Leq for the 24-hour period being considered. The Ldn adjustment made to a proposed project's potential noise impact then takes care of the normal community concerns related to night-time noise impacts.

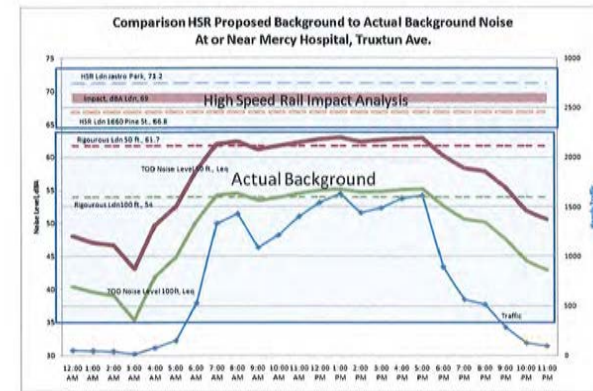
For CEQA, the appropriate EIR analysis should be prepared to answer the question: What is the effect of a passing HST on a specific receptor if the proposed project were built and a noise meter were placed at the receptor (day or night) at the time the HST actually passes?

The subject of noise analysis is very complex and important stakeholders can easily be confused by difficult and complicated presentations. However, the realities of project-related impacts are not lessened by obfuscation. While this comment attempts to unravel the mystery of the presentation focuses on the receptors at and around Mercy Hospital, the concern extends to all similarly situated urban receptors.

Figure C-20 "Noise and Vibration Measurement" sites show short-term measurement for noise which resulted in readings that are reported as greater than 64 dB noise level (presumed to be adjacent to Mercy Hospital and Truxtun Ave). This specified reading has no reference data and is presumed to be a "short-term" noise measurement that has no relevance to Ldn or CNEL (which would at least require 24 hours of continuous noise measurement to be meaningful). Tables 6-23 and 6-24 show that the data gathered as a reliable Ldn (again implying that data were properly gathered for the full 24 hours necessary to at least establish the community noise level for that specific setting).

The conversion of a 60-minute measurement (a single hour worth of data) gathered during the daytime period near a sensitive receptor at a noise level of 58 dBA misadjusted using the formulae for presenting 24-hour empirical and modeled Leq data assumes that 58 dBA were occurring during every hour for any 24-hour cycle giving a false impression that the existing background should be 64 dB every hour, day and night against which the increment is weighed during periods when this is not the case. This approach is even more interesting in the context that the speed limit along Truxtun Avenue at the hospital is 30 miles per hour and night-time traffic is less than 100 vehicles per hour. Furthermore, the speed limits in the residential areas directly adjacent to the HST easement along Truxtun Avenue are also 30 miles per hour. The chart below underscores some of the problems contained in the analysis as presented. The HST analysis proposes that the soundscape in the near-HST area ranges between 65 dBA to 70 dBA relying on the Ldn conversion. The reality as shown by the FWA modeling for traffic during each hour shows the true soundscape to be substantially quieter (i.e., 35 dBA(1h) to 62 dBA (1h)). The difference between the increment and the existing soundscape is 30 dBA at night and in the morning; this translates to an energy differential of 1000 times. The same overstatement (of background condition by extrapolating one-hour data to 24 hours) holds true for all urban area short-term manipulations.

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For CEQA, the intent of the Ldn and CNEL data is to provide a conservative analysis of incremental impacts above actual background to an affected receptor. The use of Ldn or CNEL as a means of establishing background levels inappropriately serves to increase the background through use of a 1-hour based estimated average into which up to 10 dB are added to hourly background noise at night, resulting in a false numerical value that is higher than the actual noise (soundscape).

Furthermore, the discussion in Section 3.2.1 D. "FTA Guidelines" properly shows that the modeled "[n]oise exposure is in terms of Leq (h) for Category..." Ldn implies a 24-hour cycle for background, not a single hour converted to Ldn. It is important to stress that the Ldn is not the appropriate soundscape value to test project impacts against thresholds for significance. Category 2 refers to Residences and buildings where people normally sleep. This category includes homes and hospitals where night-time sensitivity to noise is assumed to be of utmost importance and leaving one to wonder why the EIR uses an **estimated** Ldn to establish a higher soundscape value as opposed to an **actual** value for these receptors.

The correct use of the FTA Chart is as follows:

If the actual receptor background were properly used as Leq (h) for all background analysis, the residential noise levels under "Existing Noise Exposure" would likely be 40 dBA to 50 dBA at night for any hour (h), the Leq (h) would also be reported in this range, and the Ldn would be approximately 56 dBA. At a far-field distance where the HST project incremental noise level was estimated to be 60 dBA Leq, the Category 1 would be designated a Severe Impact (Significant for the EIR) for any receptor with a nighttime soundscape having a Leq(h) of less than 55dBA; Category 3 would

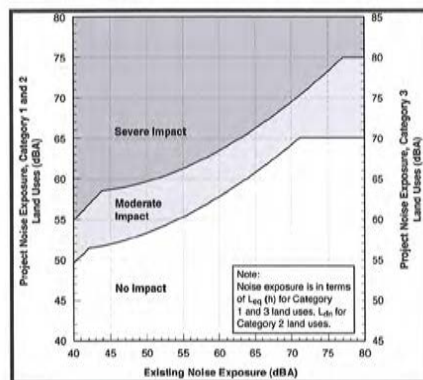
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experience a Severe Impact for any receptor with a nighttime soundscape having a  $Leq(h)$  of less than 40 dBA. However, Category 2 project impacts would be converted to Ldn (66.7 dBA) and applied to the chart showing a Severe Impact to soundscapes where the hourly background  $Leq(h)$  is as high as 66 dBA.

Using the HST impact of 69 dBA Ldn estimated for location the EIR Noise Study receptor location ST195 (1600 Pine Street) coupled with a reasonable background of 50 dBA correctly shows a "Severe Impact" in the evening night and morning hours as opposed to the erroneous presentation using a calculated value to present a soundscape having an Ldn of 66.8 dBA which would infer "No Impact".

Further, according to the FTA Guidance, "[t]he measure of noise exposure is Ldn for residential areas and  $Leq$  for land uses that do not have nighttime noise sensitivity. Since Ldn and  $Leq$  are measures of total acoustic energy, any new noise source in a community will cause an increase, even if the new source level is less than the existing level." [FTA Guidelines, §3.1.2] Therefore the incremental impact should be considered to determine the severity using Figure 3.2.



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The misapplication of the Ldn reduces the area of actual severe impacts of the HST in critical urban areas. The HST EIR represents that 2,723 residences, 11 churches, 4 schools, 1 hospital, and 1 park are severely impacted. However, the actual number of urban receptors showing severe impacts when properly assessed using the correct soundscape will be substantially greater. The severity of impacts to all sensitive receptors should be properly shown for both daytime and night-time operations in the context of actual background noise levels and not a misapplied Ldn.

In this project, the noise generated by the HST train is not a sustained phenomenon. Trains will pass through the corridor at discrete times for short durations. The pulsed disturbance felt at 8am will not be the same as the effect felt at 8pm or 2 am (when background is lower—not higher!). The background should be established for periods in the day based on the noise as measured at the time of the day that the impact-creating event occurs. The correct analysis would be to apply the HST related Ldn noise increment to the actual background noise level to reflect the impact to the community at the time an HST train passes. The use of Ldn washes the discrete data into a poorly defined overstated average that hides an important time dependent impact to sensitive receptors (homes, hospitals and schools), an impact that could be profound, adverse and irreversible.

Even FTA guidelines for recognizes the potential impacts need to be carefully considered in the context of time. When determining relevant time periods for analysis FTA states that one should, "[e]stablish relevant time periods. For each of these source types/conditions, decide what are the relevant time periods for all receptors that may be affected by this source. For **residential receivers**, the **two time periods of interest** for computation of Ldn are: daytime (7 am to 10 pm) and nighttime (10 pm to 7 am)." [FTA Guidelines§6.2.1]

Please give detailed explanation as to how the Ldn formula is an acceptable method to define background in urban locations and at important buildings housing sensitive receptors whose presence is defined by home affordability, poor health or by state mandated education obligations.

- Section 3.25 G - The EIR is inadequate in its portrayal of the Bakersfield Metropolitan Noise Element criteria.

The discussion in the Noise and Vibration Technical Study focuses on the C.O.B. Metropolitan Noise Element criteria addressing nuisance activities. These criteria rely on  $L50(h)$  and/or CNEL. Again, it is important to establish the background CNEL on actual data and not based on a single daytime hour's measurement that is extrapolated. The maximum noise level shall not exceed 60 dBA CNEL at any residence (this is inclusive of the noise increment as well as background).

Using a simple addition of two similar noise levels to achieve 60 dBA CNEL, results in the increment for the project related impact of 57 dBA CNEL, or roughly a modeled HST impact of 50 dBA  $Leq$ , (calculated by backing out the 5 and 10 dBA additions for certain hours). One can easily contour the project related impact level of 50 dBA  $Leq$  from the HST source as a point or linear source depending on distance from the source to the receptor. Using 6dBA reduction per distance doubled [ignoring the more conservative 3dBA] the ST 164 value of 62 dBA Ldn at 1357 feet, and converting the

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Ldn back to Leq, (i.e., 56 dBA Leq) one can now establish that the distance to the contour line representing the C.O.B. threshold exceeding value of 50 dBA Leq is between 2600 feet (point source) [and 5200 feet (line source)] [Noise and Vibration Technical Report Section 5.2.3], thereby extending the severe impacts well beyond the depiction provided in the EIR even when using the less protective 6 dBA per distance doubled. In fact, this indicates that the entire area in green should be considered as severely impacted and the EIR should properly reflect the greater severity of impacts. [EIR, Noise and Vibration Technical Report, Appendix F, Figures F-19 and F-20].

Further, to address the limited NEPA analysis, FTA specifically states that "[o]n the other hand, in residential areas that are not near major roadways, a full day's ambient Ldn is usually required", [FTA Guidance §6.6]. Appendix D of the FTA guidelines show that the Ldn if used alone should be adjusted based on the time-of-day of the single one-hour reading, thereby reducing the value by 2 decibels, [FTA, TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT, FTA-VA-90-1003-06, 2006]. While this may meet the minimum NEPA hurdles set forth by the FTA, it does not rise to the more protective and requirements under CEQA. [Berkeley Keep Jets Over the Bay Committee v. Board of Port Commissioners].

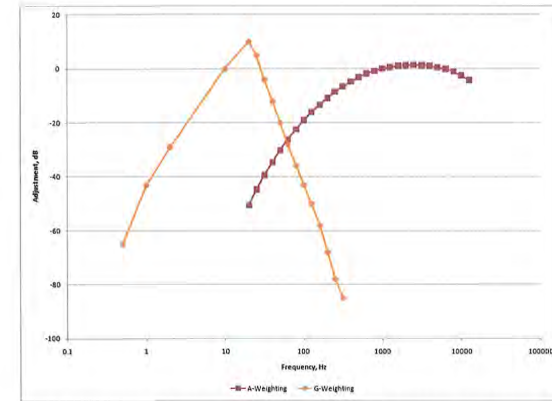
- Sections 3.4.3 and 3.4.5, Noise and Vibration Technical Report; Sections 5.0, 6.0 and Appendix G - The EIR is inadequate because the entire spectrum of noise data are only presented in dBA format.

The EIR addresses the issue of audible effects, but the use of dBA grossly understates the physiological effects of low frequency and infrasound below 100Hz. Empirical data gathered at existing HST facilities show that HST low frequency noise is a major component of trains passing specific locations. [Gori, L. et al., Acoustic characterization of high speed train ETR 500, Trenitalia – Unità Tecnologie Materiale Rotabile Sperimentazione, Firenze – Italy] [Proceedings: Low Frequency 2004, 11<sup>th</sup> International Meeting Low Frequency Noise and Vibration and Its Control, Maastricht, Netherlands.]

Additionally, construction noise profiles associated with heavy equipment show extreme levels of noise in the frequencies below 125Hz where A-weighting discounts the impact. In A-weighting, the 20 Hz octave band is reduced by 50.5 dB, and the 43 Hz band is reduced by 26.2 dB.

G-weighted data are more representative of the physiological effects to humans of noise levels below 100Hz (see following figure).

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"Low frequency noise, the frequency range from about 10 Hz to 200 Hz, has been recognized as a special environmental noise problem, particularly to sensitive people in their homes. Conventional methods of assessing annoyance, typically based on A-weighted equivalent level, are inadequate for low frequency noise and lead to incorrect decisions by regulatory authorities. There have been a large number of laboratory measurements of annoyance by low frequency noise, each with different spectra and levels, making comparisons difficult, but the main conclusions are that annoyance of low frequencies increases rapidly with level. **Additionally the A-weighted level underestimates the effects of low frequency noises.** There is a possibility of learned aversion to low frequency noise, leading to annoyance and stress which may receive unsympathetic treatment from regulatory authorities. In particular, problems of the Hum often remain unresolved. An approximate estimate is that about 2.5% of the population may have a low frequency threshold which is at least 12 dB more sensitive than the average threshold, corresponding to nearly 1,000,000 persons in the 50-59 year old age group in the EU-15 countries. This is the group which generates many complaints. Low frequency noise specific criteria have been introduced in some countries, but do not deal adequately with fluctuations. Validation of the criteria has been for a limited range of noises and subjects." [emphasis] [Leventhall HG., Low Frequency Noise and Annoyance, Noise Health, 2004]

Although the EIR and the Noise and Vibration Technical Report addresses the issue of vibration (a ground borne phenomenon) it fails to speak to the low frequency airborne noise which has been found to cause Vibroacoustic Disease. [Nuno, A.A., et al. Proceedings: Low Frequency 2004, 11<sup>th</sup> International Meeting Low Frequency Noise and Vibration and Its Control, Maastricht, Netherlands.]

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- Sections 3.4.3 and 3.4.5, Noise and Vibration Technical Report: Sections 5.0, 6.0 and Appendix G - The EIR is deficient in that it does not address location-specific phases where the noisiest construction equipment may be operating for sustained periods in areas near sensitive receptors.

Study data for sensitive receptors such as Bakersfield High School (BHS) or Mercy Hospital shows little relevant construction noise impact-related information. Appendix I, of the Noise and Vibration Technical Report for the HST EIR shows little information that reveals the impact of demolition- and foundation-related construction.

Bakersfield has a unique urban setting. The city center through which the HST is proposed has a dense mix of residential (single and multiple dwellings) as well as hospitals, churches and schools. Heavy earthmoving equipment, jackhammers and pile drivers will be necessary to ensure that the elevated rail system is suitably constructed for Seismic Zone 4 requirements. The hospital facilities contain many special-needs patients including critical care patients that are a mix of paid-in-full, as well as subsidized/disadvantaged patients that must be treated as part of the hospital's ongoing obligations. Schools must remain in operation to provide services to the inner city students. Construction within the urban area will present the City of Bakersfield schools with difficult decisions related to ensuring that the City's students are not forced to accept substandard education due to the selection of a route through the dense city center.

The presence of HST-related high-noise-impact-generating activities coupled with sensitive receptors must be considered in the EIR to adequately inform decision makers not familiar with Bakersfield's unique urban setting. Bakersfield ordinances have special provisions for such activities; see previous discussion concerning the C.O.B. Noise Element.

Mitigation for the construction noise would be to adhere to the C.O.B. noise requirements and a limit on the construction in and around school areas to weekends and limit construction activities near all other sensitive receptors to week days and daytime hours only.

- Sections 3.4.3 and 3.4.5, Noise and Vibration Technical Report: Sections 5.0, 6.0 and Appendix G - The EIR does not present an adequate analysis of the physiological effects of the HSR noise in terms of unique frequency bands.

Educators have expressed concern regarding the effect of certain noise sources on learning. As an example, BHS is an inner city school, which has a responsibility for educating students with learning difficulties whose parents are living at subsistence levels. Many of those students are also learning in an English-as-a-second-language (ESL) context. Teachers will be faced with additional challenges as trains pass directly adjacent to the historic inner city education facility 180 times a day (assuming a daytime skew) once every ten or fifteen minutes during classes.

Certain frequencies will travel through ground and past acoustic barriers. Resonance of certain frequencies in architectural features such as windows, doors and walls will create episodic nuisance affecting sensitive receptors.

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- Sections 3.4.3 and 3.4.5, Noise and Vibration Technical Report: Sections 5.0, 6.0 and Appendix G - The EIR does not consider the Kern County recommended low frequency criteria.

Kern County is a leader in the permitting and management of low frequency emitting sources (i.e., large scale wind turbine generators). Kern County has carefully considered the issue of low frequency noise in the context of large scale wind turbine projects. In the county's development of the Wind Energy Combining District criteria, the county felt that low frequency noise potential for impacts needed special criteria for evaluation.

"Low frequency noise or infrasound from wind turbine operations shall not be created which causes the exterior noise level to exceed the following limits when measured within fifty (50) feet of any existing residence, school, hospital, church, or public library."

One-third Octave Band Center Frequency (Hz)	Sound Pressure Level (dB)
2 to 1	70 (each band)
20	68
25	67
31.5	65
40	62
50	60
63	57
80	55
100	52
125	50

The same potential for low frequency impacts to receptors exists in the form of high speed trains. The same degree of sensitivity exists for county residents including those within the City of Bakersfield regardless of the source of the incremental impact and the same level of protective consideration should be afforded to all residents. It is equally important to note that in this instance the thresholds are referenced to the un-weighted (actual sound pressure levels) and not referenced to A-weighted (adjusted for audible noise). There is also an adjustment to low frequency criteria for pure tone noise.

Empirical data have been gathered for an HST in operation. Data show high noise levels associated with the lower frequencies. [Luca Gori, et al., "Acoustic characterization of high speed train ETR 500"]

#### BIOLOGY

- The general description of Biological Resources focuses on species, not location. It is difficult to determine which species are impacted by location. There are species located in Fresno and other areas that are not present in Bakersfield and vice-versa. The overall generalization does not adequately describe the impacts on biological resources by location and what specific mitigation measure applies.

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- The Biological Resources mitigation measure section uses the word "could"; not "shall" under implementation. This implies the mitigation measure is optional (example: page 3.7-121) and therefore unenforceable and ineffective, in violation of CEQA's fundamental requirements. See CEQA Guidelines § 15126.4(a)(2); *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1116.
- On page 3.7-5, the Metropolitan Bakersfield Habitat Conservation Plan (MBHCP) description should state the permit expires in August 2014. An application for extension of the permit has been submitted.
- On page 3.7-55, a conclusionary statement is made that the HSR has no impact on MBHCP. There is no discussion to support this statement. DEIR provides more discussion on the un-adopted "Draft Valley Floor Habitat Conservation Plan", than the adopted/permitted MBHCP. The EIR thus fails to comply with the requirement of CEQA that the EIR's assumptions and conclusions must be supported by facts or other data. See *Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70; *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866.
- Some references state Bakersfield is a "county", which is incorrect. (page 3.7-33)
- Bio-MM#58 (page 3.7-136) states that the San Joaquin Valley kit fox habitat replacement is at a ratio of 1:1. What is the basis for this ratio? Why was the City's Thomas Road Improvement Program (TRIP) required to mitigate habitat by the same wildlife agencies at a ratio of 3:1? Has the Authority consulted with the wildlife agencies to determine the appropriate mitigation ratio or is this just a guess? The DEIR should be more definitive in the amount of mitigation that will be required.
- On Table 3.7-18 (Level of Significance after Mitigation page 3.7-143), the Common Mitigation Measures shows "N/A" as level of significance after implementation of mitigation measures. These are not true mitigation measures under CEQA. They do not address any specific impacts. If they are not implemented, how does that affect the quality of or level of significance reduced under the other mitigation measures?
- There is no direct discussion as to what permits are required by/from the US Fish and Wildlife Service (USFW) and California Department of Fish and Game (CDFG). What Federal and/or State permits are required? Pages 3.7-3 through 5 list applicable laws and regulations but doesn't specify how they will be applied to HSR.
- Both the B1 and B2 alignments cross through the Kern River linkage, an important wildlife crossing area. As described in Section 3.7 Biological Resources and Wetlands, impacts to wildlife movement through the corridor would be blocked by fencing during construction activities. This would result in a moderate effect under NEPA and a significant effect under CEQA. The Westside Parkway (now under construction) utilizes minimal amounts of fencing and, where required, it is restricted around areas of construction staging and where public safety is an issue. The Westside Parkway has also installed large culverts with protective gratings at known wildlife crossings to allow wildlife to freely cross under the freeway. During PS&E, HSR should restrict the use construction fencing to areas where construction would pose general safety hazards. The mitigation measures employed on the Westside Parkway project are feasible,

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would reduce or avoid the potential impacts, and can be incorporated into the proposed project. Please discuss these additional mitigation measures and either recommend their adoption or explain why they are not selected. CEQA Guidelines § 15126.4(a)(1)(B).

- The HSR intends to prepare and implement a Habitat Mitigation and Monitoring Plan (HMMP) to mitigate for temporary and permanent impacts on jurisdictional waters and state streambeds (Bio-MM#60) but ignores other types of upland habitats. The Westside Parkway is required to provide compensatory mitigation for sensitive species for habitat outside of the Kern River using the MBHCP on a fee per acre basis. The fee is based on pre-negotiated compensation ratios for impacts (permanent versus temporary) and habitat types (disturbed/ruderal, non-native grassland, saltbush scrub, and riparian). The mitigation ratios vary from 4:1 for permanent impacts to non-native grassland to as low as 1:1 for temporary impacts to disturbed/ruderal areas. For riparian habitat within the Kern River streambed, the Westside Parkway is required to mitigate at 4:1 using the Kern Water Bank Authority lands. The mitigation measures employed on the Westside Parkway project are feasible, would reduce or avoid the potential impacts, and can be incorporated into the proposed project. Please discuss these additional mitigation measures and either recommend their adoption or explain why they are not selected. CEQA Guidelines § 15126.4(a)(1)(B).

### SAFETY

- Page 3.11-27 discusses train derailment and how physical elements such as containment parapets, check rails, guard rails, and derailment walls would be used in specific areas with high risk of or high impact from derailment. However, nothing is identified as to where these high risk areas are located. The project design features beginning on page 3.11-37 do not specifically identify whether these physical features are or are not incorporated into the track design and where they occur.
- On page 3.11-34 regarding hazards of flooding, there is no mention that Isabella Dam is under the authority of the US Army Corp of Engineers or that Isabella reservoir has limited capacity because the dam is in need of repair and upgrade. Furthermore, the project does not state how it complies with the 2009 Lake Isabella Dam Failure Evacuation Plan and the impact of flooding affecting the HSR and piers that support the elevated portions of the track.
- There is no discussion regarding the possibility of terrorist activities that could occur along any portion of the elevated track through the city.
- There is no mention of train collisions and if the physical barriers to prevent derailments would be effective. How likely would the physical barriers be able to contain a head-on collision at over 200 mph, especially on the elevated section of track? What would happen if the physical barriers failed to contain the trains involved in a head-on collision? What about the impact at grade where no derailment barriers are provided?
- S&S-MM #2 on page 3.11-38 states that there will be payment of an impact fee to local fire, rescue and emergency service providers. This is pretty broad. What is the fee being proposed? Will that fee actually pay for anticipated services of the various

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agencies? CEQA is clear in its requirement that the payment of a fee alone is not sufficient mitigation. (*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692.) The EIR/EIS also must provide substantial evidence that payment of the impact fee actually will result in avoiding or substantially reducing the potential impact. (*Gray v. County of Madera* (2008) 167 Cal.App.4th 1099.) In addition, the EIR/EIS must identify a plan or program which the public agency is committed to implementing that will use the impact fee to accomplish actual mitigation of the significant impact. (*Anderson First Coalition v. City of Anderson* (2005) 130 Cal.App.4th 1173.)

- There is no discussion about the electrification of the track and its impact to public safety or wildlife. Furthermore, in an emergency, how is electrification handled and how easily is it turned off so that emergency personnel and injured people will not become electrified, especially if the system does not turn off automatically?

### SOCIOECONOMICS

- Regarding economic and socioeconomic impacts, the City recognizes that the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and the Fifth Amendment of the United States Constitution are applicable to the project as described on page 3.12-82. However, the impacted development includes several forms of public financial assistance such as HUD entitlement grant funds, redevelopment funds, State of California grants, and tax credits; therefore, removal of the housing in any way prior to the periods of affordability as required for such funding sources (in many cases, up to 55 years of affordability) would likely result in significant repayment penalties to the developers and the City above and beyond fair market value of any such property, yielding potentially significant economic impacts. In addition, replacement of 160 low-, moderate- and middle-income (LMMI, earning < 120% Area Median Income) units, and relocation of approximately 450 LMMI residents is problematic when assessing the number of current vacant affordable units available in the Bakersfield market and the number of desirable sites for replacement units which would provide similar proximity to services and transportation.
- In Section 3.12.8 (CEQA Significance Conclusions), impacts SO-2 and SO-3, the division of existing communities in northeast and northwest Bakersfield, is identified as being a significant impact after mitigation. As stated previously, a CEQA alternative which bypasses existing Bakersfield communities must be included as part of the EIR analysis as a means to avoid or reduce significant environmental effects, including but not limited to impacts SO-2 and SO-3. Another potential alternative which could avoid or reduce impacts SO-2 and SO-3 is a below-grade system through established Bakersfield communities. Both alternatives would avoid or substantially reduce unmitigated significant impacts to noise and land use and, absent substantial evidence of infeasibility, must be analyzed in the EIR.
- Because a significant number of businesses will be required to be relocated, the Authority should identify specific relocation mitigation, including but not limited to, assisting businesses through the permitting process at their new site and ensuring that infrastructure necessary for a business is in place, entitlements exist for the business, and additional funds above and beyond the typical relocation process are available

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to address the hardships encountered with a move, including loan assistance and resulting business closure or bankruptcy.

- Both the BNSF alternative and the Bakersfield South alternative will adversely impact a number of City facilities, including but not limited to, the City's Corporation Yard, Police Service Center, Communications Facility, City Hall South parking lot and the Rabobank Arena & Convention Center parking lot. The corporation yard houses a number of facilities that are an integral part of the City's operations. Any disruption to these operations will negatively impact our ability to provide essential services to the citizens of Bakersfield, i.e. police, fire, refuse collection, etc. The City has previously voiced its concerns about these impacts to the High Speed Rail Authority who has chosen to ignore them. As such the EIR/EIS is inadequate and misleading as it only addresses those impacts that can be mitigated. The EIR/EIS is insufficient because it does not address or mitigate the impacts to these City operations that have the potential to affect public services and public safety for thousands of residents.
- The EIR/EIS does not address impacts to the Rabobank Arena/Convention parking lots. The Rabobank Arena/Convention Center is the largest venue in the southern San Joaquin Valley. These parking lots are necessary to accommodate large events than can number over 10,000 attendees. It is typical for these large events to book several months or more in advance. However, the EIR does not address either the temporary or permanent impacts or how this will affect events already booked. If the City cannot guarantee sufficient parking for these events, they will go elsewhere. In addition to the impacts on public parking, loss of these events would potentially cost the City millions in direct revenue, sales tax, and occupancy tax, which would have an adverse indirect effect of public services and public safety.
- East Bakersfield is not the only environmental justice area that the rail will impact. Similar housing areas exist in the downtown area along California Avenue and Truxtun Avenue, and in the northwest area along Glenn Street, Enger Street, Jewetta Avenue and Verdugo Lane. Additionally, Bakersfield High School would be considered an inner-city school.

### LAND USE

- The Draft EIR/EIS appears to attempt to address such economic impacts by stating that the proposed project will substantially increase economic opportunities in the vicinity of the Bakersfield HST station, based on ridership projections for the full state-wide system. More specifically, the EIR/EIS states on page 3.13-15 that impacts are less than significant because "indirect effects on surrounding land uses would be beneficial, encouraging more-efficient land use patterns that are in agreement with Bakersfield planning goals." However, due to projected HST costs and existing funding for the HST system, the feasibility of constructing such a system beyond the segments described in the Merced-Fresno EIS and Fresno-Bakersfield EIR/EIS is highly questionable. Thus, ridership projections beyond the scope of the Merced-Bakersfield route are highly speculative and inappropriate for forming conclusions regarding economic impacts to a station area. Development of the project segments as described in the Fresno-Bakersfield EIR/EIS will, for the foreseeable future, result in removing all residential units (and approximately 35% of land area), which are crucial to the viability of any mixed-use neighborhood such as South Mill Creek.

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- According to Appendix 3.1-A of the Draft EIR/EIS, all affordable housing in South Mill Creek will be permanently impacted by the project. On page 3.13-35 (Station Planning, Land Use, and Development), the document acknowledges that the City of Bakersfield has adopted redevelopment plans in the vicinity of Bakersfield's proposed HST station. The document, though, does not adequately recognize direct impacts to the 160 units of South Mill Creek affordable housing, nor does the EIR/EIS accurately address the economic impact on the redevelopment project as a whole, including the potential impacts associated with urban decay that may occur. See *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184.
- On page 3.13-12, the following Metropolitan Bakersfield General Plan implementation measure is referenced: "Local agencies should cooperate in studies to pursue establishment of high-speed rail service for the plan area, including consensus on potential routes and terminal locations." What the EIR fails to note, however, is that concerns raised by City staff with respect to impacts to established communities, businesses, institutions, and vital governmental facilities in response to proposed HST alignment plans have been ignored by the Authority. Instead, the EIR contains generalized, unsubstantiated conclusions to justify that the benefits of the HST system to the State of California and to the environment would greatly outweigh any adverse impacts which might result at the local level. In accordance with CEQA, the purpose of an EIR is to disclose to the public and to decision makers the potentially significant environmental effects of a project and to identify ways in which such effects can be avoided or reduced. Justifying the overriding benefits of a project relative to its environmental effects is not one of the roles of an EIR; rather, in accordance with State CEQA Guidelines Section 15093 a statement of overriding considerations supported by evidence in the record must be made by a decision-making body at the time they approve a project for which an EIR identifies unmitigated environmental effects. See *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866.
- On page 3.13-31 in the Station Planning, Land Use and Development section of the EIR/EIS, the document mentions that 4,500 parking spaces would be provided in one or two structures, depending on the alternative site chosen. In addition, four parking lots are located approximately 0.5 miles or less, from the proposed station location. Section 3.13 got the number correct insofar as the parking requirement, but the transportation section did not as previously stated.
- Page 3.13-11 states that the HSR would be located on lands designated as high and low density commercial and industrial. It is unclear if the DEIR is identifying this as existing policy or if the Authority believes the HSR has been limited to these areas. This statement is misleading. It fails to identify that the HSR will also be located over residential, open space and recreation lands and as such, is inconsistent with the city's General Plan and will result in significant adverse impacts on land use and planning.
- On page 3.13-12, Implementation Measure 10 of the City's General Plan is referenced that local agencies should cooperate in studies to pursue the establishment of high speed rail service for the plan area, including consensus on potential routes and terminal locations. Although the City has had numerous meetings with the HSR Authority, the Authority has never worked with the City to alter routes or explore

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alternatives to address impacts on city resources or other public facilities. Issues brought forward by staff such as Bakersfield High School, Mercy Hospital, East Bakersfield, the convention center, and current road construction projects were never resolved. The Authority, although invited numerous times to address the Planning Commission and City Council to provide public dialog, never accepted. Instead, the Authority has decided to defer all discussion during the comment period of this DEIR rather than have open and honest discussions with stakeholders and the public concerning the project.

- Page 3.13-12 indicates that both stations are within the Old Town Kern Redevelopment area. This is incorrect. The stations are within the Southeast Bakersfield Redevelopment area.
- Page 3.13-13 states that station alternatives have been planned in collaboration with cities. What the statement fails to acknowledge is that because the rail alternates were already established by the Authority without any initial input from the city, this predetermined the station locations. Few details were ever provided for analysis by City staff. Stations were always conceptually shown making it difficult to adequately determine the compatibility with local land use plans, goals and policies. Actual rail route footprints and rights-of-way were never provided until the release of the DEIR.
- Under the no project alternative there is a statement that communities may not attract transit oriented development (TOD) without the HSR. This is not true. Within the City, active TOD-type projects are underway. The proposed HSR will actually remove a new TOD and negatively impact the economic viability of the remaining development. The DEIR should acknowledge that current general plans encourage mixed use and infill development. Although the HSR is noted in the Plan, it is not a critical element in the eventual development of mixed use or TOD projects within the City.
- Page 3.13-27 mentions that alignments in Bakersfield would follow existing transportation corridors. This is not entirely correct. South of Rosedale Highway (SR-58), both alternatives move away from the existing BNSF corridor and through established residential areas. The Bakersfield South alternative goes through established business districts and residential neighborhoods east of the proposed station.
- On page 3.13-27, it notes that the effects from the conversion of land for the alternatives, HST stations and HMF during construction are considered negligible under NEPA and land use impacts from construction are considered less than significant under CEQA. We disagree. There is nothing in the DEIR how these determinations were made. For example, the temporary impacts upon the convention center parking and loading areas would be significant as these disruptions would affect the ability of the city to attract or possibly retain events, thereby reducing income to support the facility. This is one of many instances where it is very unclear in the DEIR what the impacts are to these properties and how the Authority intends to address them. The lack of facts or other data to support the assumptions and conclusions in the EIR/EIS renders it inadequate and incomplete. (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70.)
- CEQA expressly requires an EIR to evaluate whether a proposed project will physically divide an established community. (CEQA Guidelines, Appendix G). However, there is

## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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no discussion in the EIR/EIS of the permanent division of the community that will occur. The rail will create a significant barrier. What happens under the elevated portion of the track? Will it be fenced? What uses would be permitted underneath these areas? We understand that the City of Fresno already has experienced urban decay impacts under overpasses in its urban area. Bakersfield Police and Code Enforcement have also experienced similar urban decay issues under existing overpasses in Bakersfield. This division may impact neighborhoods and business areas to the degree that they could become undesirable, unattractive, and eventually abandoned resulting in urban decay. Remnant parcels too small to be used for any development will become an attractive nuisance being used for illegal dumping of debris. What if the Authority acquires developed land but leaves empty buildings for years before the project is actually built, or the project stalls permanently? This increase the amount of urban decay in the area. The EIR/EIS needs to analyze whether the project will cause or contribute to urban decay impacts. (*Bakersfield Citizens for Local Control v. City of Bakersfield* [2004] 127 Cal.App.4th 1184.)

- One of the alleged benefits of the project is that it will reduce air travel trips. However, the EIR/EIS fails to disclose and discuss the potential adverse impacts on existing air transportation services serving local communities, such as Meadows Field in Bakersfield. There is no mention of the impact to these other transportation land uses or the extent of the reduction in air travel which is expected to result from the Project. CEQA clearly requires an EIR to provide sufficient detail in its analysis to determine the extent of the potential impacts. (*Galante Vineyards v. Monterey Peninsula Water Mgmt. District* [1997] 60 Cal.App.4th 1109, 1123.) Could the reduction of demand for these regional airports result in closure and contribute to urban decay of these areas?

### PARKS

- In Section 3.15 Parks, Recreation, and Open Space, page 3.15-21, the discussion for the Kern River Parkway discusses the effects of construction activities and the creation of noise and visual changes. The analysis is inadequate and incomplete because it does not address the effects of operational noise from trains operating overhead on an elevated track and the effect on the recreational use of adjacent parks, bikeways and hiking trails. The visual change with the introduction of an elevated rail system is expected to be dramatic (see Figure 3.16-27) and not negligible as concluded on page 3.15-30.

### VISUAL

- Aesthetics and Visual Resources VQ-MM#3 only requires HRS designers to "consider" local jurisdiction input. This is not appropriate or feasible mitigation under CEQA since it provides no specific information about the mitigation or if such will reduce the stated impacts. Furthermore, it defers making a determination to a later time, which is inconsistent with CEQA.
- VQ-MM#3a does not specify the extent of the "financial compensation" for park land replacement or where required. The DEIR and mitigation measures need to identify which parks are removed and how much park land will be acquired.

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- VQ-MM#3b, 4a and 4b states that trees and landscaping will be planted to visually screen the HRS. There is no identification of when or where the planting would occur, no responsible party for maintenance, and no funding mechanism for on-going replacement and operations (watering, trimming and replacement). As a result, the proposed mitigation is incomplete, ineffective and illusory.
- Impacts VQ#6 (Lower visual quality in the Rosedale, Kern River, and Central Bakersfield Landscape Units) and VQ#10 (Noise wall would block views) are identified in Table 3.16-5 as significant after mitigation. These impacts would result from the need to construct elevated guideways and noise walls where the HST traverses urbanized areas in Bakersfield and other communities. As stated previously, a CEQA alternative which bypasses existing urbanized areas must be included as part of the EIR analysis as a means to avoid or reduce significant environmental effects, including but not limited to visual quality impacts. Another potential alternative which could avoid or reduce visual quality impacts is a below-grade system through urbanized areas. Both alternatives would avoid or substantially reduce unmitigated significant impacts to visual impacts, noise, and land use. Absent substantial evidence of infeasibility, these alternatives must be analyzed in the EIR.

### CULTURAL

- Page 3.17-51, Table 3.17-7, Significant Historic Architectural Resources by Alternative, does not identify SR-204 or Union Avenue as an historic resource. In August 2010, the Department of Transportation (Caltrans) prepared a Historical Resources Compliance Report (HRCR) for the Relinquishment of State Route 204. Caltrans determined that SR 204 (Historic US 99) from Airport Drive and SR 99 to Brundage Lane meets the National Register of Historic Places (NRHP) criteria. The California State Historic Preservation officer (SHPO) concurred on September 21, 2010 with Caltrans' determination and agreed to add SR 204 to the Master List of State-owned Historical Resources. SR 204 may require additional mitigation subject to SHPO approval. The failure to analyze the potential impacts of the proposed project on these historical resources renders it inadequate and incomplete. See *Madera Oversight Coalition v. County of Madera* (2011) Cal.App.4th, 2011 DJDAR 13943.

### REGIONAL GROWTH

- Table 3.18-2 shows that Bakersfield's annual average growth rate will be 5.9% annually until 2035. This means that the city will increase its population an average of over 20,000 people per year over the next 25 years. This is grossly in error. City projections only show a population in the mid-400,000 range in 2035 with an average growth rate of between 1.5 and 2.5% per year. Even during the boom years in the early to mid-2000's, the city never achieved the projected growth rate stated in this table. If these figures were used to estimate future housing growth and in turn, potential ridership, then any assumptions that relied on those numbers are incorrect. A number of experts have disputed the Authority's projections and provided detailed factual and other data which shows that the Authority's projections regarding financial feasibility of the Project and its anticipated economic benefits, including job creation, are vastly overstated and not supported by the evidence. Newspaper articles and other publications discussing these expert reports and providing the web addresses, at which the reports are available, are included with these comments as Attachment 3.

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- On page 3.18-16 under No Project alternative, please note (again) that Bakersfield is not a county.
- Under the No Project alternative, HSR is not a critical element for the City to meet its land use goals. The City's General Plan notes this to be a potential component of the transportation system, but our goals are not dependent upon it being developed. Furthermore, to state under this alternative that cities will have a difficult time reducing low density development is not based on fact as with or without the HSR, TOD, mixed use and high density housing will continue to be encouraged and developed as required by state policy (e.g., SB 375) and as market conditions dictate.
- Beginning on page 3.18-17, the employment tables are deceiving and may mislead people trying to understand the employment figures. Each year is depicted with employment figures as annual job years. The table concludes there will be 7,200 job years, which is the cumulative total over an eight year period. However, this is not the total number of jobs. In the narrative that follows, the terms jobs and job years are intermingled, which gives the wrong impression of overall employment. It should be made clear that the number of actual jobs created by the project is much different (lower) than job years. The number of actual jobs should have been provided. A number of experts have disputed the Authority's projections and provided detailed factual and other data which shows that the Authority's projections regarding the Project's anticipated economic benefits, including job creation, are vastly overstated and not supported by the evidence. Newspaper articles and other publications discussing these expert reports and providing the web addresses, at which the reports are available, are included with these comments as Attachment 3.

CALIFORNIA HIGH-SPEED TRAIN PROJECT

STATEWIDE MULTIMODEL TRAVEL DEMAND MODEL  
DEVELOPMENT AND APPLICATION



## CALIFORNIA HIGH-SPEED RAIL RIDERSHIP AND REVENUE MODEL

### DEVELOPMENT, APPLICATION, AND PROJECT-LEVEL EIR/EIS FORECASTS

November 2010

Prepared by



with Cambridge Systematics Inc.

For the California High Speed Rail Authority

PLEASE NOTE: This is a DRAFT version and not the final report. Several items are still to be resolved. In addition, while the following should be obvious from the text, it is stressed that the information and results presented in this appendix are estimates and projections based in part on subjective judgments, and will undoubtedly be materially different from the actual future ridership and revenue. As a result none of the outcomes and results in this appendix is in any way guaranteed or promised. The material presented in this memorandum was developed in order to estimate the environmental impacts of various high speed train service configurations. As such, growth forecasts, future transportation networks, and other significant items were required by state and federal environmental regulations to be based on officially adopted governmental plans, which were not independently assessed.

This document has been prepared by **Parsons Brinckerhoff** for the California High-Speed Rail Authority and for application to the California High-Speed Train Project. Any use of this document for purposes other than this Project, or the specific portion of the Project stated in the document, shall be at the sole risk of the user, and without liability to PB for any losses or injuries arising for such use.



## Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Table 6- 4: Highest Station Boardings and Access Activity, 2035

Average Weekday*	2035 Boardings			2035 Access Activity*																				
	Origin Station	Inter-regional	Local	Total	Motorized Vehicles				Rental				Walkers											
					Dropping Off Passes	Arriving to Park	Parking Space Demand	Car Brought Back	Cars Brought Back	Taxis Off	Transit/ Shuttle Alignings	Bicyclists Other Non-Motorized												
San Francisco**	29,400	11,000	40,400	3,300	2,900	9,800	1,800	2,300	10,300	11,300	3,300	1,200	1,200											
Midvale	1,600	4,400	6,000	700	700	1,100	300	300	1,300	1,300	700	800	1,000											
Redwood City	4,700	3,100	7,800	1,100	1,200	3,000	400	400	800	800	1,100	1,000	2,600											
San Jose	8,700	3,900	12,600	1,200	1,400	3,800	500	600	2,800	2,800	1,200	1,400	3,600											
Gilroy	5,700	1,000	6,700	1,200	2,100	6,400	200	300	200	200	1,200	2,100	300											
Sacramento	19,100	0	19,100	1,600	2,700	9,000	900	1,100	4,400	4,000	1,600	2,700	400											
Stockton	6,700	0	6,700	1,000	1,900	8,600	300	400	600	600	1,000	1,900	300											
Merced**	7,600	0	7,600	1,200	2,300	7,700	400	400	600	300	1,200	2,300	400											
Fresno	8,400	0	8,400	1,300	2,200	7,400	400	400	700	400	1,300	2,200	500											
Bakersfield**	9,200	0	9,200	1,400	2,300	8,100	400	400	900	500	1,400	2,300	400											
Palmdale	8,600	8,700	17,300	3,400	5,200	11,300	400	700	600	400	3,400	5,200	400											
Sylmar	10,300	3,100	13,400	2,600	3,400	9,700	200	400	500	400	2,600	3,400	400											
Burbank***	2,500	4,300	6,800	1,000	900	1,900	400	300	700	800	1,000	900	400											
Los Angeles	14,100	15,000	29,100	2,300	2,300	4,600	1,200	1,400	7,500	8,300	2,300	2,300	400											
Newark	4,000	3,000	7,000	800	1,300	3,100	400	400	800	900	800	1,300	400											
Anaheim**	25,400	5,100	30,500	2,800	5,000	13,700	1,600	1,700	6,200	6,500	2,800	5,000	400											
Ontario	5,600	5,400	11,000	1,600	1,800	3,900	700	600	1,100	1,300	1,600	1,800	300											
Riverside	10,600	3,700	14,300	2,500	3,100	8,600	700	400	1,000	500	2,500	3,100	400											
Temecula/ Mar Vista	5,400	2,000	7,400	1,500	2,000	5,500	100	200	100	200	1,500	2,000	100											
Escondido***	9,000	300	9,300	1,200	1,600	5,000	500	500	1,100	1,200	1,200	1,600	200											
University City	6,000	200	6,200	1,200	1,700	5,600	100	200	100	200	1,200	1,700	200											
San Diego	19,500	400	20,300	1,800	2,200	7,200	1,000	900	4,300	4,000	1,800	2,200	400											
City of Industry	4,100	2,600	6,700	1,400	1,600	4,500	100	200	300	200	1,400	1,600	200											
Menlo Park	4,600	0	4,600	700	1,300	4,300	200	300	400	200	700	1,300	200											
Total Daily	231,200	77,200	308,400	Forecast base	Forecast base	Forecast base	Forecast base	Forecast base	Forecast base	Forecast base	Forecast base	Forecast base	Forecast base											
Annualization Factor	365	252	346	* 12/2008 Full System for all stations except as noted										1										
Annual (millions)	84.4	22.5	106.7	** 12/2008 Phase 1										1										
*** Interregional from EIRIS Full System (08/2008) with changes due to parking cost estimated																								
**** EIRIS Full System (08/2008) with changes due to parking cost estimated																								

† Egress is minor of access



Table 6- 7: Phase 1 Terminal Stations Boardings and Access, Full System 2030

Origin Station	2030 Boardings		2030 Access Activity*											
	Inter-regional	Local	Total	Autos Dropping Off Passes	Motorized Vehicles Arriving to Park	Cumulative Parking Space Demand	Rental Cars Brought Back	Taxis Dropping Off Passes	Transit/ Shuttle Alignings	Walkers Bicyclists Other Non-Motorized	Autos Dropping Off Passes	Motorized Vehicles Arriving to Park	Cumulative Parking Space Demand	Rental Cars Brought Back
San Francisco*	23,800	10,600	34,500	2,500	2,000	6,500	1,500	1,900	9,500	10,600	2,500	2,000	6,500	1,500
Merced*	7,200	0	7,200	400	700	2,000	100	100	200	400	700	700	2,000	100
Anshiem	16,100	5,600	21,700	1,700	3,300	5,100	1,200	1,600	5,500	4,500	1,700	3,300	5,100	1,200
Forecast base														

\* 12/2008 Full System for all stations

† Egress is minor of access



Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

## ATTACHMENT 2

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#### Areas of Special Expertise:

California Environmental Quality Act (CEQA) and Land Use Law

#### Current Advisory Matters:

- \* **San Diego Unified Port District:** Currently serving as special counsel to the Port District on CEQA matters, working with the Port Attorney, planning staff and consultants in the preparation of environmental review documents for proposed development projects, including the North Embarcadero Port Master Plan Amendment, San Diego Convention Center expansion, and the development of new and expanded hotels and related facilities on San Diego Bay.
- \* **County of Kern, California:** Currently serving as special counsel to Kern County on CEQA matters, working with County Counsel, planning staff and consultants in the preparation of environmental review documents for regulatory ordinances and proposed development projects.
- \* **County of Kings, California:** Currently serving as special counsel to Kings County on CEQA matters, working with County Counsel, planning staff and consultants in the preparation of environmental review documents for regulatory ordinances and proposed development projects, including the California High Speed Rail Project.
- \* **City of Bakersfield, California:** Currently serving as special counsel to the City of Bakersfield on CEQA matters, working with the City attorney, planning staff and consultants in the preparation of environmental review documents for regulatory ordinances and proposed development projects.
- \* **City of Calexico, California:** Currently serving as special counsel to the City of Calexico on CEQA matters, working with the City Attorney, planning staff and consultants in the preparation of environmental review documents for proposed development projects.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

- \* **City of Carlsbad, California:** Currently serving as special counsel to the City of Carlsbad, working with the City Attorney, planning staff and consultants in California Energy Commission's licensing proceedings for a new proposed power plant.
- \* **City of Solana Beach, California:** Currently serving as special counsel to the City of Solana Beach, working with the City Manager, City Attorney, planning staff and consultants in evaluating the potential environmental impacts associated with proposed redevelopment of the Del Mar Fairgrounds and Racetrack, expansion of the Interstate 5 North Coast Corridor, proposed SANDAG 2050 Regional Transportation Plan, and other development projects.

**Current Litigation:**

- \* **Preserve Calavera v. City of Oceanside:** Currently representing the City of Oceanside in an action challenging the adequacy of an EIR prepared for the proposed extension of Melrose Drive.
- \* **Unite Here Local 30 v. San Diego Unified Port District (Sunroad Hotel):** Currently representing the San Diego Unified Port District in an action alleging the Port District violated CEQA, the Harbors and Navigation Code and Alquist-Priolo Act in approving a proposed new hotel on Harbor Island.
- \* **CREED-21 v. City of Calexico:** Currently representing the City of Calexico in a CEQA lawsuit challenging the adequacy of the City's compliance with CEQA prior to its approval of a cooperation agreement with the Calexico Redevelopment Agency.
- \* **El Pueblo Para El Aire Y Agua Limpio v. County of Kings:** Currently representing Kings County in a lawsuit challenging the adequacy of an EIR prepared for the proposed expansion of a Class I hazardous waste disposal facility in Kettleman Hills, California, and alleging violation of environmental justice and anti-discrimination regulations.
- \* **Friends of Avira v. City of Carlsbad:** Currently representing the City of Carlsbad in a CEQA lawsuit which alleges the City should have prepared an EIR, rather than a mitigated negative declaration, before adopting an amendment to the Housing Element of its General Plan.
- \* **County of Los Angeles Sanitation District, et al. v. County of Kern:** Currently defending Kern County in a state court action and cross-action regarding the validity of an ordinance regulating the land application of sewage sludge, involving claims of noncompliance with CEQA and violation of Proposition 13 and the Commerce, Due Process and Equal Protection Clauses of the United States and California constitutions.

- \* **Sierra Club v. City of Bakersfield (Saco Ranch):** Currently representing the City of Bakersfield in a CEQA lawsuit which challenges the adequacy of an EIR prepared for a large residential development project.
- \* **Sierra Club v. City of Bakersfield (Stockdale Ranch):** Currently representing the City of Bakersfield in a CEQA lawsuit which challenges the adequacy of an EIR prepared for a large residential development project.

**Significant Public Agency Representation:**

- \* **Save Our Heritage Organization v. San Diego Unified Port District:** Represented the San Diego Unified Port District in a CEQA lawsuit challenging the adequacy of an EIR prepared for the demolition of former aircraft manufacturing buildings at the San Diego International Airport.
- \* **San Diego Navy Broadway Complex Coalition v. San Diego Unified Port District:** Represented the San Diego Unified Port District in an action alleging the Port District violated CEQA, the California Coastal Act and the Port Master Plan in approving construction of a new cruise ship terminal on Broadway Pier.
- \* **San Diego Navy Broadway Complex Coalition v. United States Coast Guard (San Diego Unified Port District):** Represented the San Diego Unified Port District in a federal court action which alleged the U.S. Coast Guard and the Port District violated federal national security regulations by not enforcing a mandatory security zone around cruise ships berthed at the Broadway Pier.
- \* **Citizens for Honesty and Integrity by Calexico Officials v. Heffernan Memorial Healthcare District (City of Calexico):** Represented the City of Calexico in a CEQA lawsuit challenging the adequacy of an EIR prepared for a commercial development and the adequacy of the Housing Element of the City's General Plan.
- \* **Citizens for Responsible Equitable Environmental Development v. City of Calexico (Mega Park):** Represented the City of Calexico in a lawsuit challenging the adequacy of an EIR prepared for a commercial development and the adequacy of the Housing Element of the City's General Plan.
- \* **City of Los Angeles, et al. v. County of Kern:** Represented Kern County in a federal court lawsuit which alleged that an initiative ordinance which prohibited the land application of sewage sludge violated the Commerce and Equal Protection Clauses of the United States Constitution and was preempted by federal and state law.
- \* **Citizens for Responsible Planning v. City of Bakersfield:** Represented the City of Bakersfield in a CEQA lawsuit which alleged the EIR prepared for a commercial shopping center and discount grocery store project failed to adequately analyze and mitigate urban decay and long-term traffic impacts.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

- \* **Coalition for Honesty and Integrity in Calexico v. City of Calexico:** Represented the City of Calexico in a CEQA lawsuit challenging the adequacy of an EIR prepared for a large commercial development, including an off-reservation Indian casino, and the adequacy of the Housing Element of the City's General Plan.
- \* **Hogar Dulce Hogar v. Escondido Community Development Commission:** Represented the City of Escondido and its Community Development Commission in an action challenging the funding of low income housing under the Community Redevelopment Law and a cross-action against the County of San Diego seeking reimbursement for overpayments under a related tax sharing agreement.
- \* **Unite-Here Local 30 v. San Diego Unified Port District (Lane Field):** Represented the San Diego Unified Port District in a CEQA lawsuit which alleged an Addendum to a Master EIR previously certified by the Port District failed to adequately analyze the potential impacts of a proposed hotel project.
- \* **Canyons, LLC v. City of Bakersfield:** Represented the City of Bakersfield in a CEQA lawsuit which alleges the City should have prepared an EIR, rather than a Negative Declaration, for amendments to a hillside development ordinance.
- \* **DKS Investments, LLC v. City of Bakersfield (The Canyons):** Represented the City of Bakersfield in a declaratory relief action under the Subdivision Map Act concerning the applicability of a hillside development ordinance to an application for approval of a tentative tract map for a large residential subdivision.
- \* **Sierra Club v. City of Bakersfield (Ten Section):** Represented the City of Bakersfield in a CEQA lawsuit which alleges the City failed to prepare an EIR which adequately evaluated the potential impacts on water supply availability, global climate change, prime agricultural land and general plan consistency for a proposed residential development and related general plan amendment, rezoning and related land use approvals.
- \* **Sierra Club v. City of Bakersfield (Santa Barbara Capital):** Represented the City of Bakersfield in a CEQA lawsuit which alleges the City failed to prepare an EIR which adequately evaluated the potential impacts on prime agricultural land of a proposed residential and commercial development and related general plan amendment, rezoning and related land use approvals.
- \* **Downtown Business Owners Assn. v. City of Escondido:** Represented the City of Escondido in a CEQA lawsuit challenging the adequacy of its environmental review under CEQA for a hotel development jointly sponsored by the city and a private developer.

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- \* **Bakersfield Citizens for Local Control v. City of Bakersfield (Castle & Cook Commercial - CA, Inc.):** Representing the City of Bakersfield in a CEQA lawsuit challenging the adequacy of the EIR prepared for the development of a large retail shopping center and Wal-Mart Supercenter in Bakersfield, CA.
- \* **Bakersfield Citizens for Local Control v. City of Bakersfield (Panama 99 Properties, LLC):** Represented the City of Bakersfield in a CEQA lawsuit challenging the adequacy of an EIR prepared for the development of a large retail shopping center and Wal-Mart Supercenter in Bakersfield, CA.
- \* **Oxy Resources of California v. City of Bakersfield (Rosedale Ranch):** Represented the City of Bakersfield in a CEQA lawsuit which alleges the City failed to prepare an EIR which adequately evaluated the potential impacts on oil and other mineral resources of a proposed residential and commercial development and related general plan amendment, rezoning and related land use approvals.
- \* **Sierra Club v. City of Bakersfield (Rosedale Ranch):** Represented the City of Bakersfield in a CEQA lawsuit which alleges the City failed to prepare an EIR which adequately evaluated the potential impacts on prime agricultural land of a proposed residential and commercial development and related general plan amendment, rezoning and related land use approvals.
- \* **Nancy Schmidt v. San Diego Unified Port District:** Represented the Port District in a lawsuit challenging the adequacy of its environmental review under CEQA of a public project to improve public access and to control beach erosion in Imperial Beach, CA.
- \* **Coshow v. City of Escondido:** Represented the City of Escondido in the appeal of a lawsuit challenging the validity of the City's plan to fluoridate its water supply in compliance with the California Safe Drinking Water Act.
- \* **Orange County Sanitation Districts, et al. v. County of Kings:** Represented Kings County in a lawsuit challenging the validity of its approval of an ordinance regulating the land application of biosolids, involving claims of noncompliance with CEQA, inverse condemnation and violation of the commerce and due process clauses of the United States and California constitutions.
- \* **City of Bakersfield v. City of Shafter:** Represented the City of Bakersfield in a CEQA lawsuit challenging the adequacy of the environmental review prepared by the City of Shafter for a proposed expansion of its sphere of influence and the related municipal services review.
- \* **Southwestern Community College District v. California Dept. of Transportation:** Represented Southwestern Community College District in a lawsuit challenging the adequacy of the environmental review prepared for a federal highway project and related eminent domain proceedings.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

- ✧ **California Association of Sanitation Agencies, et al. v. County of Kern:** Represented Kern County in a federal court lawsuit which claimed Kern County's adoption of an amended ordinance regulating the land application of biosolids violated the commerce, due process and equal protection clauses of the United States Constitution.
- ✧ **San Diego County Regional Airport Authority v. San Diego Unified Port District:** Represented the Port District in a CEQA lawsuit challenging the adequacy of its environmental review and its jurisdiction under state law to approve a public airport parking facility in San Diego, CA.
- ✧ **County of Kern v. State Water Resources Control Board:** Represented Kern County in a lawsuit which established the State Board failed to comply with CEQA before approving a General Order regulating the application of biosolids on farmland throughout California.
- ✧ **Shean Magan v. County of Kern:** Represented Kern County in two lawsuits which alleged Kern County abused its discretion in denying plaintiffs application for an extension of time to continue land applying Class B biosolids and approved an ordinance regulating the land application of biosolids which resulted in an unlawful taking of plaintiffs property without just compensation.
- ✧ **Save Our Heritage Organization v. San Diego Unified Port District:** Represented the Port District in a CEQA lawsuit challenging the adequacy of its environmental review of a lease for portions of an historic rail line in Chula Vista, CA.
- ✧ **Pacific Gateway, Ltd. v. San Diego Unified Port District:** Represented the San Diego Unified Port District in settling a lawsuit challenging the Port District's compliance with CEQA before approving the South Embarcadero Redevelopment Program 2, a Port Master Plan amendment for construction of the Campbell Shipyard Hotel, the Fifth Avenue Landing Spinnaker Hotel and related coastal improvements.
- ✧ **CityFront Terrace, LLC v. San Diego Unified Port District:** Represented the San Diego Unified Port District in a CEQA lawsuit challenging the approval of South Embarcadero Redevelopment Program 1, a Port Master Plan amendment for the expansion of the Hyatt Hotel and Seaport Village and the creation of a new public park in the South Embarcadero.
- ✧ **San Diego Police Historical Association v. San Diego Unified Port District:** Represented the San Diego Unified Port District in a CEQA lawsuit challenging approval of South Embarcadero Redevelopment Program 1, a Port Master Plan amendment for the expansion of the Hyatt Hotel and Seaport Village and the creation of a new public park.
- ✧ **San Diego Unified Port District v. Environmental Health Coalition:** Represented the San Diego Unified Port District in bringing an action to enforce a CEQA settlement agreement concerning the fumigation of agricultural commodities at the Tenth Avenue Marine Terminal, the Port District's import and distribution facility.
- ✧ **Mountain Shadows Mobile Home Park Association v. City of Escondido:** Represented the City of Escondido and the Escondido Community Development Commission in a construction defect lawsuit arising out of the City's purchase and conversion of a mobile home park to resident ownership.
- ✧ **Environmental Health Coalition v. San Diego Unified Port District:** Represented the San Diego Unified Port District in a lawsuit challenging the adequacy of the Port District's compliance with CEQA in approving the conversion of the Tenth Avenue Marine Terminal to a cold storage facility for the fumigation and distribution of imported agricultural commodities.
- ✧ **Yee v. City of Escondido:** Represented the City of Escondido in a lawsuit filed by the owners of nine mobile home parks, challenging the City's mobile home park rent control ordinance and alleging inverse condemnation, takings and civil rights claims.
- ✧ **Native Sun/Lyon Communities v. City of Escondido:** represented the City of Escondido in a lawsuit challenging the adequacy of the City's compliance with CEQA and the California Planning and Zoning Law in denying approval of a large residential development.
- ✧ **Water Quality Association v. City of Escondido:** Represented the City of Escondido in a lawsuit challenging the adequacy of its compliance with CEQA in approving a municipal water reclamation project and enabling ordinance.
- ✧ **Escondido Sunrise Ridge, Ltd. v. City of Escondido:** Represented the City of Escondido in a lawsuit alleging inverse condemnation and violation of civil rights as a result of the denial of an application for permits for a residential development project.
- ✧ **Lynch v. City of Escondido:** Represented the City of Escondido in a lawsuit for inverse condemnation and violation of civil rights by an apartment building owner concerning a "seniors only" housing ordinance.
- ✧ **Kel-Cal v. City of Carlsbad:** Represented the City of Carlsbad in settling a lawsuit filed by a developer for inverse condemnation and civil rights violations concerning the approvals needed for a large residential project.
- ✧ **Hinsvark v. City of Encinitas:** Represented the City of Encinitas and a property owner in a lawsuit challenging the adequacy of environmental review under CEQA for the approval of a large residential and commercial project (Ecke Ranch).

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**Significant Property Owner Representation:**

- \* **Padres Hacia Una Vida Mejor v. Gray Davis, Governor (Safety-Kleen, Inc.):** Represented Safety-Kleen, Inc. in a lawsuit and subsequent administrative proceedings under the Tanner Act, which sought to impose more restrictive regulatory conditions on a Class I hazardous waste treatment, storage and disposal facility.
- \* **Padres Hacia Una Vida Mejor v. County of Kern (Laidlaw Environmental Services Inc.):** Represented Laidlaw Environmental Services, Inc. and County of Kern in federal and state administrative proceedings (EPA, HUD, DTSC, RWQCB) and litigation challenging the approvals for expansion of a Class I hazardous waste treatment, storage and disposal facilities, involving Tanner Act, CEQA and "environmental justice" civil rights claims.
- \* **Albertson's, Inc. v. City of Palmdale:** Represented Albertson's, Inc. in a CEQA lawsuit challenging a city's approval of a zoning variance allowing the conversion of a portion of a commercial shopping center to school use.
- \* **Palmdale School District v. Albertson's, Inc.:** Represented Albertson's, Inc. in an eminent domain lawsuit by a school district, which sought to condemn a shopping center use restriction prohibiting schools in a commercial shopping center.
- \* **State of California (CalTrans) v. Uhlmann (Albertson's, Inc.):** Represented Albertson's, Inc. in an eminent domain lawsuit by CalTrans to condemn a portion of a commercial shopping center.
- \* **Palla v. County of Kern (Laidlaw Environmental Services Inc.):** Represented Laidlaw Environmental Services, Inc. in a citizens lawsuit challenging approvals for expansion of a Class I hazardous waste treatment, storage and disposal facilities, involving Tanner Act, CEQA and California Planning and Zoning Law claims.
- \* **Local Assessment Committee v. Kern County (Laidlaw Environmental Services Inc.):** Represented Laidlaw Environmental Services, Inc. in a lawsuit filed by a Local Assessment Committee, challenging the adequacy of compliance with the Tanner Act in approving expansion of a Class I hazardous waste treatment, storage and disposal facility.
- \* **Treasure Island Associates v. City of Laguna Beach:** Represented the owner of Treasure Island Mobile Home Park in several lawsuits concerning relocation mitigation payments required in order to close the mobile home park, involving CEQA, Mobile Home Residency Act, Ellis Act, inverse condemnation, takings and civil rights claims.

- \* **Caritas Company (Encinitas Ranch):** Represented the Caritas Company in defeating an initiative and in obtaining approvals to develop a large residential and commercial project, including CEQA review, the termination of Williamson Act contracts, municipal annexation, general plan amendment, specific plan approval, rezoning, and various other site specific approvals.
- \* **San Diego Unified School District v. Tenth Avenue Cold Storage Company:** Represented the lessee of a public facility for the importation, fumigation and distribution of agricultural commodities in a lawsuit challenging the adequacy of compliance with CEQA for the project's permits.
- \* **Harbor Fumigation, Inc. v. San Diego County Air Pollution Control District:** Represented Harbor Fumigation, Inc. in a lawsuit challenging the jurisdiction of the county air pollution control district to regulate methyl bromide emissions under the Tanner Act.
- \* **Neighborhoods United v. City of Encinitas (Home Depot USA, Inc.):** Represented Home Depot in a lawsuit challenging the adequacy of compliance with CEQA and the California Planning and Zoning law for the development of a large home improvement center, and assisted the project applicant in developing and implementing a successful campaign to defeat a referendum which sought to set aside approval of the project approvals.
- \* **Swinton v. City of Poway:** Represented property owners in a lawsuit challenging the approval of a residential subdivision in violation of CEQA and the California Planning & Zoning Law.
- \* **J.W. Jones Co. v. City of San Diego:** Represented a real estate developer in an action challenging inclusion of property in a facilities benefit assessment district, involving Proposition 13, civil rights and inverse condemnation claims.
- \* **Summerhouse Inn v. City of San Diego:** Represented the owner of a hotel in bringing a lawsuit to set aside a city's revocation of land use permits previously issued for expansion of the hotel and in obtaining a substantial financial settlement of regulatory takings claims.
- \* **Taylor v. County of San Diego:** Represented the property owner in successfully suing, twice in five years, to reinstate permits for the operation of a sand and gravel mining project which had been revoked by a county.
- \* **Christward Ministry v. City of San Marcos:** Represented an adjoining property owner and several citizen action groups over a period of ten years in a series of lawsuits challenging the adequacy of CEQA compliance and other environmental review for general plan amendments, conditional use permits and development agreements for a proposed waste-to-energy project and a materials recovery facility.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

- \* **Christward Ministry v. County of San Diego:** Represented an adjoining property owner and citizen action groups over a period of five years in several lawsuits challenging the adequacy of CEQA compliance and other environmental review for the expansion of a Class III solid waste landfill.
- \* **Leach v. City of San Marcos:** Represented an individual taxpayer who challenged the adequacy of CEQA compliance for a redevelopment plan.
- \* **Christward Ministry v. California Pollution Control Financing Authority:** Represented a property owner which challenged the adequacy of a state bonding agency's compliance with CEQA before authorizing the issuance of \$185 million of bonds for a proposed waste-to-energy project.
- \* **Putnam Foundation v. City of San Diego:** Represented an art museum in Balboa Park which challenged the adequacy of the City's compliance with CEQA before approving the proposed construction of certain improvements in the park.
- \* **Christward Ministry v. State Water Resources Control Board:** Represented a property owner in an action challenging the approval of waste discharge requirements under the Porter-Cologne Water Quality Act for the expansion of a Class III solid waste landfill.
- \* **Wiltshire v. City of San Marcos:** Represented the proponent of a land use initiative in an action alleging the measure was pre-empted by state law.

**Professional Experience:**

- \* Hogan Guiney Dick LLP, San Diego, CA (1995-present)
- \* Gray Cary Ware & Friedenrich (formerly Gray Cary Ames & Frye), San Diego, CA (1980-1995)

**Education:**

- \* J.D., Boston College Law School (*magna cum laude*)
- \* B.A., Lake Forest College



Resume for

**Mary Jane Wilson**

**WZI Inc.**

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



**MARY JANE WILSON, R.E.A.**  
**President**

**EDUCATION/CERTIFICATION**

B.S., Petroleum Engineering, Stanford University, 1972  
State of California Registered Environmental Assessor No. 00050  
State of California Accredited Lead Verifier of Greenhouse Gas Emissions Data, Executive Order H-09-63  
Special Government Employee, Department of Energy Ultra-Deepwater Advisory Committee  
Member, National Petroleum Council  
Director – Mission Bank, Audit Committee  
Director – Greater Bakersfield Chamber of Commerce  
Patent Nos. US 6,659,178 B2 Apparatus and Method For Sealing Well Bores and Bore Holes, US 6,860,997 B1 Apparatus and method for processing Organic Materials  
Past Director - California Independent Petroleum Association  
Past Director - Kern Economic Development Corporation and Chairman  
1994 Journal of Petroleum Technology Editor, January Issue and 1994 Review Chairman  
Society of Petroleum Engineers - Member since 1972, Environment Health and Safety Committee Member, 1993 Distinguished Lecturer, Co-chairman SPE/EPA Exploration & Production Environmental Conference, 1997, Chairman SPE Monograph Committee, Editor Monograph Volume 18 Henry L. Doherty Series, *Environmental Engineering for Exploration and Production Activities*  
1993-94 Advisory Board - San Joaquin Valley Chapter, American Petroleum Institute  
Stanford School of Earth Sciences, Stanford University - Advisory Board and former National Fundraising Chairman  
Member - Air and Waste Management Association, American Petroleum Institute, Association of Groundwater Scientists and Engineers, Central California Association of Power Producers, California Groundwater Association, California Independent Petroleum Association, California Living Museum, National Water Well Association and the Water Association of Kern County, Central California Association of Power Producers  
Member at Large - Conservation Committee of California Oil and Gas Producers  
Member - West Coast Advisory Group of the Petroleum Technology Transfer Council  
Member - PITT National Labs Partnership Work Group  
The Council of One Hundred - California State University, Bakersfield  
Future Bakersfield - Mayor's Action Team, Strategic Vision Plan  
Women's Advisory Council - Girl Scouts, Joshua Tree Council  
Graduate, Hill & Knowlton Media Training Seminar  
Soroptimist Achievement Award, 1976 Outstanding Professional Woman, L. A. Area

**SPECIAL AREAS OF EXPERTISE:**

**Regulatory Compliance:**

**WZI INC.**

Participates on an ongoing basis in regulatory reform programs both nationally and locally.

- Management of contracts where WZI acts as the client's representative in the coordination of business goals and permit conditions in large projects requiring interagency cooperation. This includes preparation of permit documents, technical support documents, public hearing representation and community relations.
- Provides strategic planning for compliance with regulations, the formulation of operations tracking protocols which improve agency/industry communication where permit conditions require a good understanding of a project.
- Working with regulatory agencies in the interpretation of "intent" of environmental regulations when applied to projects especially where Federal, State and local regulations are not clearly presented or have overlapping jurisdiction.
- Provides management direction on protocol design and implementation of environmental audits (site assessments, compliance audits, risk appraisals).
- Expert testimony in litigation involving groundwater contamination.
- Expert testimony and advise in litigation involving air emissions, health risk.

**Petroleum:**

Serves on the National Petroleum Council. Council advises, informs and makes recommendations to the Secretary of Energy with respect to matters submitted to the Council by the Secretary of Energy representing the views of the energy industry.

- Expert Witness Moss v. Venoco, Chevron et al. for Air Emissions, Due Diligence, Standard of Care
- Appointed by Congress to advise on the operation of the Naval Petroleum Reserve No.1 (Specific Expertise in Environmental Compliance)
- Over thirty years of oil and gas operations and reservoir engineering experience.
- Prepared numerous U. S. Securities Exchange Commission Reserves Appraisals and fair market valuations on oil and gas producing properties.
- Prepared numerous enhanced oil recovery development plans.
- Economic Analysis of business alternatives in oil/gas exploration and operations both domestically and internationally.
- Negotiated settlements regarding wastewater issues of independent refineries.
- Presentation to the National Electrical Generation Association regarding California Electrical Restructuring.

**Power Generation:**

WILSON - 2

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

1

WZI INC.

2

WZI INC.

- Kern County Electrical Advisory Committee member.
- California Independent Petroleum Association Oil Producers Electrical Project member.

**PROFESSIONAL EXPERIENCE:**

1986 - Present	<p><u>President, Chief Executive Officer: WZI Inc.</u></p> <p>Defines and directs the overall management objectives of WZI Inc. Ms Wilson provides technical standards for all projects on an as-needed basis, to assure client satisfaction, monitors all projects for contract compliance and technical content.</p> <p>WZI Inc. headquartered in Bakersfield, California. WZI Inc. is an environmental and consulting engineering company, which has achieved a reputation for high quality, successful project management. WZI is a State of California Verification Body for AB32 Greenhouse Gas Mandatory Reporting, Executive Order Number H-10-173. WZI offers professional and technical services in regulatory compliance (air, water, waste), geoscience, hydrology, site characterization, hazardous waste management, and environmental impact assessment. WZI offers its clients a uniquely high level of expertise, an innovative, technical approach and disciplined project management.</p>
1982 - 1987	<p><u>Partner: Evans, Carey &amp; Crozier</u></p> <p>Represented numerous clients in environmental matters related to regulatory compliance and reservoir engineering. Supervised geological and groundwater studies, performed subsurface engineering and design, and made alternative recommendations, all related to hazardous and non-hazardous waste injection facilities. Expertise has been utilized in obtaining the necessary permits required by EPA, DOHS, RWQCB and various county agencies. Conducted detailed environmental assessments of hazardous waste site selections, all of which meet the demands of CEQA, and were utilized in EIR preparation.</p>
1979 - 1982	<p><u>Consultant: Evans, Carey &amp; Crozier</u></p> <p>Represent Evans, Carey &amp; Crozier with clients. Designed and implemented enhanced recovery and waste disposal programs including all permitting activities. Prepared property appraisals and evaluations.</p>
1972 - 1979	<p><u>Engineer: Texaco, Inc.</u></p>

WILSON - 3

Initially, assisted in the evaluation of secondary recovery projects and pilot flood performance. Performed reservoir analysis, log interpretations and economic analyses. Based on this knowledge, was given the task of supervising all drilling and production activities for a major secondary recovery project in which she devised a new water entry survey technique. Studied the drilling potential in California, Nevada, and Alaska, and the development of several steam flood recovery projects. Asked to represent Texaco in unit negotiations, testify before government agencies and obtain all necessary permits. Also assisted in developing the Division's investment budget.

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

**WZI INC.**

**PUBLICATIONS:**

- Englehardt, John, M.J. Wilson, et al., 2001, New Abandonment Technology New Materials and Placement Techniques, S.P.E. Paper No. 66496.
- Wilson, M.J. and J.D. Frederick, 1999, Editors, SPE Monograph Volume 18 Henry L. Doherty Series, Environmental Engineering for Exploration and Production Activities.
- Wilson, M. J. and S. C. Kiser, 1994, Transactional Environmental Assessments: Use in the Identification of Viable Enhanced Oil Recovery Projects, S.P.E./DOE Paper No. 27782.
- Wilson, M. J. and S. C. Kiser, 1993, Site Assessment Methods in Determination of Liability in Oil and Gas Property Acquisition and Divestiture, S.P.E. Paper No. 25834.
- Wilson, M. J. and J. D. Frederick, 1993, Particulate Emission Testing Methodologies as Applied to Natural Gas Fired Turbines, S.P.E. Paper No. 25945.
- Wilson, M. J. and S. G. Muir, 1992, A Critique of Selected Case Studies in Environmental Geophysics, S.P.E. Paper No. 23998.
- Kiser, S. C., M. J. Wilson and L. M. Bazeley, 1990, Oil Field Disposal Management Practices in Western Kern County, California in proceedings from First International Symposium on Oil and Gas Exploration and Production Waste Management Practices, New Orleans, Louisiana, p.677-688.
- Wilson, M. J., Kiser, S. C., E. J. Greenwood, R. N. Crozier, R. A. Crewdson, 1987, Oil Field Disposal Practices in the Hydrogeologic Setting of the Midway-Sunset and Buena Vista Oil Fields: A Review of Past Effects, Current Activities and Future Scenarios, American Association of Petroleum Geologists, Bull. V. 72, No. 3, p.394 Abs.
- Wilson, M. J. and S. C. Kiser, 1987, Proceedings of Hazmacon 1986 Conference April 29 - March 1, 1986, Anaheim, California, Synergistic Approach for Siting and Design for Injection of Hazardous Liquid Wastes: Case Study in Western San Joaquin Valley, Kern County, California, S.P.E. Paper No. 16327
- Wilson, M. J., 1979, The Santos: A Case History of Fractured Shale Development, S.P.E. Paper No. 7978.
- Wilson, M. J., 1974, A Young Engineer's Personal Look at the "Guidelines", S.P.E. Paper No. 4913.



**Resume for**

**Jesse D. Frederick**

**WZI Inc.**

WILSON - 5

1717 28<sup>TH</sup> STREET BAKERSFIELD, CALIFORNIA 93301 (661) 326-1112 FAX: (661) 326-0191

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued



**JESSE D. FREDERICK**

**EDUCATION/CERTIFICATION:**

USN, Surface Nuclear Mechanical Operator, 1974  
B.S., Chemical Engineering, Rose-Hulman Institute of Technology, 1981  
State of Texas Registered Professional Engineer  
Member – American Institute of Chemical Engineering, Society of Petroleum Engineers,  
American Chemical Society, Association of Energy Engineers  
Dow Chemical, USA Environmental Management  
California Air Resources Board: Certified Lead GHG Verifier

**SPECIAL CONTRIBUTIONS and RECOGNITIONS:**

Recipient: Chevron Presidents Award for development of a new venture Business Plan  
CoEditor: SPE Environmental Monograph Environmental Engineering for Exploration and  
Production Activities  
Guest Lecturer: Rose-Hulman Institute of Technology (1993) Advanced Coal Gasification  
Technology, USC (2001) Electrical Deregulation, SPE (2002) Electrical Deregulation, EUEC  
(2010)-Strategic Analysis of GHG Programs, Impacts on Reliability  
Panelist – Valuing NO<sub>x</sub> Offsets, Panel Discussion, Sponsored by Air Quality Week, 1993  
Patent for: Steam Blow Silencer, Well Abandonment Technology, Anaerobic Digester  
IOGCC, Oil and Gas Exploration and Production Environmental Reporting Requirements  
DOE, Title V Guidance Manual for E&P industry  
National Petroleum Council, Peer Review for Studies on Natural Gas Pipeline Infrastructure,  
1999  
API, Toxic Release Inventory Report on Exploration and Production  
Member of Texas NO<sub>x</sub> RACT Advisory Group, 1993  
Board Member: Society of Petroleum Engineers (San Joaquin Valley Chapter)  
Board Member: Kern County Taxpayers Association  
Member: Kern County Chamber of Commerce Regulatory Advisory Committee

**SPECIAL AREAS OF EXPERTISE:**

- Contract assessment and negotiations.
- Business Planning including financial pro-forma and risk analysis.
- Modeling
  - Gas and Electricity Price Forecasting and Refinery Margin Analysis
  - Noise Impact Analysis, Finite Models: TNM, ENM, CORONA.
- Participation in the sale and acquisition of large energy assets for Fortune 500  
Companies.
- Developed and implemented the audit procedure for cogeneration facilities and oil and  
gas producing properties for a Fortune 500 company.
- Oversaw the environmental aspect of the development process for over thirty power  
projects, through initiation to various stages of development including financial  
closing.
- Federal, state and local regulations, including FERC, NEPA, SEQRA, CEQA, PSD,  
NSPS, and NPDES as well as European environmental law.
- Expert testimony in both legal and semi-adjudicatory proceedings regarding: valuation  
of environmental externalities, energy values, facility siting, environmental dispatch,  
impact of standard offer contracts on property values, refinery product and property  
valuation.

**FREDERICK – 2**

**WZI INC.**

- Collaborated in the preparation of power project proposals. This included design and  
budgeting coordination for engineering, economic and engineering evaluations of  
various options.
- Forensic analysis of facility failures and on/offsite consequences.

**PROFESSIONAL EXPERIENCE:**

1994 - Present      Vice President - WZI Inc.

Responsible for the technical scoping of large projects which require  
multi-disciplinary integration. Responsible for technical peer review of  
on-going projects. Mr. Frederick acting on behalf of major clients has  
performed internal energy studies for long-term purchase and production  
plans as well as negotiated major energy contracts. In overseeing client  
regulatory compliance, Mr. Frederick advises clients regarding approaches  
to permitting and regulatory guidelines, including facilitating the  
Department of Energy's sale of the Elk Hills Naval Petroleum Reserve.  
Directs the planning, development and implementation of policies,  
programs and procedures in support of contract management. Mr.  
Frederick provides assistance in WZI's National Petroleum Council  
activities. Mr. Frederick holds a patent for an industrial noise silencer and  
has supervised and performed noise management and operational and  
environmental noise studies for numerous projects including over  
1000MW of Large Scale Wind Turbine Generation, over 1000MW of  
Fossil-Fired Generation and Mixed-Use and Residential projects. Mr.  
Frederick is responsible for identifying business opportunities, expert  
advice on energy forecasts, valuations, business planning and provides  
business development services to numerous clients and has also served as  
a testifying expert on environmental regulations and utility ratemaking in  
states such as California, New York, Texas, as well as at the federal level.

1995 - 1998      President - CONSUMERS Utility Advisors, Inc.

Provided staff leadership in strategic planning and technical negotiations  
for the emerging energy markets in California. Clients included Fortune  
500 integrated energy companies. He also directed corporate activities  
including business development, goal setting and quality assurance. Mr.  
Frederick was responsible for business planning and economic models for  
various clients.

1982 - 1994      Manager of Environmental Affairs, Destec Energy, Inc.

Promoted from Project Development, Mr. Frederick provided analytical  
support for multi-million dollar projects. The increased need for firm  
project management in the area of environmentally related issues led to a  
promotion to establish the Environmental Affairs department for the Dow  
energy subsidiary and management of the day-to-day activities of the  
Environmental Affairs staff. In this role Mr. Frederick, reported to senior  
management and oversaw all domestic and international environmental  
issues related to upstream and downstream energy production including:  
property sales and acquisitions, permitting, compliance, and  
facility/property audits for all Destec facilities including coal gasification  
projects, 740,000 acres of oil and gas properties, as well as superfund sites.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

FREDERICK – 2

WZI INC.

Mr. Frederick wrote internal energy related planning documents for board consideration and implementation. Mr. Frederick was a team member for all business acquisitions and financial projects and participated in contracts and closings.

1981 - 1982

Engineer, M.W. Kellogg

Served in the Mechanical Division (Special Equipment Group) designing and procuring specialized chemical/refining and power generation equipment.

FREDERICK – 3

WZI INC.

PUBLICATIONS:

Frederick, J. D., 1990, "Gas Turbine Emissions," Industrial Energy Technology Conference  
Frederick, J. D. and B. Tulloh, 1991, "Title III of the Clean Air Act and BACT," Society of Petroleum Engineers Forum  
Frederick, J. D., 1992, "Clean Air Act Title III and the Oil Industry," Society of Petroleum Engineers  
Frederick, J. D., 1993, "Air Emissions Trading," SPE/EPA Exploration & Production Environmental Conference, San Antonio, TX, 7-10 March 1993  
Frederick, J. D., 1993, "Effective Environmental Management," SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, 29-30 March 1993  
Frederick, J. D. and S. Jenkins, 1993, "Cogeneration and Meeting California Environmental Requirements," 8th Cogeneration & Independent Power Congress, Boston, MA, 15-16 June 1993  
Frederick, J. D. and W. Lessig, 1993, "Environmental Considerations of Coal Gasification Technology and the Wabash River Repowering Project," American Power Conference, Boston, MA, 1993  
Frederick, J.D. and Wilson, M.J., 1993, Particulate Emission Testing Methodologies as Applied to Natural Gas Fired Turbines, S.P.E. Paper No. 25945  
Frederick, J. D. and M.S. Weaver, 1997, *Title V and the Exploration and Production Industry*, S.P.E. Paper No. 37883.  
Frederick, J. D. and Mary Jane Wilson, 1999, Editors, SPE Environmental Monograph Environmental Engineering for Exploration and Production Activities  
Frederick, J. D. *Meter-based Cost Impact of Energy and GHG Regulation and Operational Mitigation*, AEE Conference on Strategic Planning for Energy and the Environment, 2010

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Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**DAVID CLARK**

David Clark is a Senior Project Manager with more than 33 years of experience managing, overseeing, and preparing planning and environmental documents for large-scale multidisciplinary transportation projects. He has extensive experience preparing Environmental Impact Statements (EISs) and Environmental Impact Reports (EIRs), Environmental Assessments (EAs), Initial Studies (ISs), and Mitigated Negative Declaration (MNDs) for California Environmental Quality Act/National Environmental Policy Act (CEQA/NEPA) compliance for Caltrans and the Bureau of Land Management (BLM) and Bureau of Indian Affairs (BIA). He has managed large scale planning-level documents such as major investment studies (MISs), corridor analyses, and alternative feasibility studies for the Riverside County Transportation Commission (RCTC), Orange County Transportation Authority (OCTA), and San Bernardino Associated Governments (SANBAG).

David is currently the Environmental Program Manager for the \$1.2 Billion Thomas Roads Improvement Program (TRIP) for the City of Bakersfield. His responsibilities include the management of several consultant teams in the preparation and delivery of initial planning, technical studies, and EDs for the 24th Street Improvement EIR/EA, Rosedale Highway Widening IS/EA, SR-178/Morning Drive EIR/EA, SR-178 Widening IS/EA, Hageman Flyover IS/EA, and Centennial Corridor EIR/EIS within Caltrans District 6. He has also managed and prepared several revalidations for Westside Parkway and preliminary environmental assessment reports (PEARs) for the SR-99 North and South projects, as well as the Hageman Flyover and SR-178 Widening projects.

David oversees mitigation compliance and biological monitoring for Westside Parkway phases 1, 2, and 4. He is responsible for permit compliance for the U.S. Army Corps of Engineers (Section 404), CDFG, California Department of Fish and Game (1602 Streambed Alteration Agreement), Central Valley Flood Protection Board (Encroachment Permit), and California Regional Water Quality Control Board (Section 401) for Westside Parkway at the Kern River. David is also working closely with Caltrans District 6, the U.S. Fish and Wildlife Service (USFWS), and CDFG to implement a program-wide mitigation plan for state- and federally-listed endangered species for the San Joaquin kit fox.

**ROBERT SCALES**

Mr. Scales is a civil and transportation engineer with a broad background in the design and planning of highways, light rail transit, commuter rail, intermodal facilities, train stations, bus transit services, and goods movement systems. His expertise includes project development, feasibility studies, concept through final design, management and operations, economic evaluation, and public presentations. His work includes area-wide transportation plans, transportation corridor analysis, intermodal planning, traffic engineering, transit system evaluation, design and operations. Mr. Scales directs the technical analysis and formation of recommendations and final designs for a wide variety of transportation investments, and the group's transportation planning practice. Mr. Scales is experienced with coordinating efforts among multiple federal, state, and local agencies, citizen groups, and task forces.

In Bakersfield, Mr. Scales has served as Traffic Study Manager for the Thomas Road Improvement Program (TRIP), which includes 16 projects encompassing road widening, new interchanges, new freeways and connecting roadways. Program management role includes conceptual studies and review of traffic studies performed by corridor consultants. Work includes recalibration of the Metropolitan Planning Organization regional travel demand model.

His 40 years of experience includes major traffic studies for I-15 and U.S. 95 in Las Vegas for the Nevada Department of Transportation, traffic studies and goods movement studies for the California Department of Transportation in the San Francisco Bay Area, transit studies for light rail transit in San Jose and San Diego and for the Pittsburg-Antioch extension of BART in San Francisco, railroad station studies for Caltrain service on the San Francisco Peninsula and for the extension of commuter rail service in Monterey County, California.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

## ATTACHMENT 3

Financial analysis keeps pressure on rail effort - Bakersfield.com

### Financial analysis keeps pressure on rail effort

BY John Cox Californian staff writer

jcox@bakersfield.com | Monday, Sep 19 2011 05:31 PM

Last Updated Monday, Sep 19 2011 05:32 PM

An updated study of the steep financial challenges facing California's High-Speed Rail proposal underlines the pressure on project officials as they wrap up an important business plan due next month.

The report's main findings -- that the project's construction is severely underfunded and that the system would require an operating subsidy ruled out three years ago in a voter-approved \$9 billion state bond measure -- have been widely discussed. What's new is that authors of the report released Monday say updated figures show that the situation has worsened.

For example, they conclude that the project's actual price tag has increased to \$66 billion from the \$43 billion estimate released in 2008. The report also forecasts annual operating deficits of between \$2.2 billion and \$4.6 billion -- not the \$2.4 billion surplus project officials predicted in 2009.

The report arrives just weeks before a highly anticipated business plan is due before a state Legislature divided over the project. The business plan is expected to discuss many, if not all, of the issues raised in the report, such as where money would come from to finish building the project and who would operate it once built.

A project spokeswoman did not respond to a request for comment Monday.

Construction is planned to begin late next year between Bakersfield and Merced. By 2020, the system is proposed to link Anaheim and San Francisco with trains traveling up to 220 mph. Plans call for expanding that initial phase to add stops in San Diego and Sacramento.

The study is essentially an update to previous reports issued by the same group of three men, two private-sector executives and a retired Stanford professor who said the group donated its time to produce the study. He said all three authors live in the area around Palo Alto, where opposition to the rail project has been fierce.

Assuming the initial phase gets built at a cost of \$66 billion, servicing the bond debt would cost the state \$4.6 billion a year, the study states. Over 30 years, it says, that would cost taxpayers between \$65 billion and \$137 billion.

The report reiterates doubts that the federal government will contribute the full \$18 billion called for to finish the project; only \$3.3 billion has come through, and many question Congress's commitment to continue investing in the project despite strong support from the Obama administration.

Also, the California High-Speed Rail Authority has not yet identified who exactly would contribute the roughly \$11 billion earlier deemed reasonable to expect from the private sector.

"The Authority's financial plans, even at these early stages of engineering studies, continually veer from the optimistic to the aspirational," the authors of the study released Monday state in their preface.

Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

Community Coalition on High Speed Rail

Latest from CC-HSR  
Financial Risks - 2011  
Edition

REVISITING ISSUES IN  
THE OCTOBER 2010 REPORT

THE FINANCIAL RISKS OF  
CALIFORNIA'S PROPOSED  
HIGH-SPEED RAIL PROJECT  
- THE 2011 EDITION -

A Project Consuming \$700,000 Each Working Day  
In The Confident Hope Of A Miracle!

September 14<sup>th</sup> 2011

Here is the quotation from the October 2010 Financial Risks Report's cover, with new portions modified by bold typeface.

"We do not oppose high-speed rail in concept. It seems to work in parts of Europe and Japan and possibly elsewhere; **albeit with deep construction and continuous operating subsidies, illegal under AB3034.** The 2008 Prop1A promise that captured many voters was that the California High-Speed Rail (CHSR) would not cost the taxpayer a penny **more than the \$9Billion approved by Proposition 1A.** After months of work on this report, **six other reports, a complete financial analysis and twenty Notes,** we are forced to conclude that the Authority's promise **seems is an impossible goal.**"

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The Financial Risks of California's Proposed High-Speed Rail Project



The Community Coalition on High-Speed Rail is proud to make available financial analyses of the proposed California High-Speed Rail Project, prepared by a citizen panel of business and financial experts.

2011 Edition



Click on the icon to the left to access a copy of The Financial Risks of California's Proposed High-Speed Rail Project - the 2011 Edition. This new 2011 edition of Financial Risks explores the even more devastating results of the project's increased costs and lack of new Federal grants.



2010 Edition

Click on the links below to access a copy of the 2010 The Financial Risks of California's Proposed High-Speed Rail Project and its appendices.

The Financial Risks of  
California's Proposed  
High-Speed Rail  
Project

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2010 Financial Risks of  
California's Proposed  
High-Speed Rail  
Project

APPENDIX A  
Appendix A (.pdf)

2010 Financial Risks of  
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APPENDIX B  
Appendix B (.pdf)

2010 Financial Risks of  
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APPENDIX C  
Appendix C (.pdf)

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10/10/2011

# Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

## Community Coalition on High Speed Rail

The review, released in October 2010, concludes that the California High-Speed Rail Authority's financing plans are not fiscally sound. Operating the High-Speed Train as currently proposed would be financially risky for any operator. Building it as currently planned could mean financial ruin for any investor and jeopardize the State's fiscal health. The review represents months of work, and its conclusions have been endorsed by over seventy knowledgeable, non-partisan reviewers ("Principal Reviewers"), who signed their names in support of its findings and conclusions. Names of the Principal Reviewers start on page two of the review.

Principal authors of the review are:

**Alain C. Enthoven:** Mariner S. Eccles Professor of Public and Private Management (emeritus), GSB Stanford; President, Lital Medical Products, Economist, Rand Corporation; President's Award for Distinguished Federal Civilian Service; Baxter Prize for Health Services Research; Fellow American Academy of Arts and Sciences; Founder, Jackson Hole Group (BA Economics, Stanford; Rhodes Scholar-Oxford; PhD Economics, MIT)

**William H. Grindley:** World Bank, Associate Division Director, SHI International; Founder and CEO, Pacific Strategies, Inc. (Master of City Planning, MIT)

**William Warren:** Officer, US Navy. Forty years of Silicon Valley finance, sales and consulting experience and management, including CEO of several start-ups, Director/Officer at IBM, ROLM, Centigram, and Memorex (BA Political Science, Stanford; MBA, Stanford)

### Financial Analysis of the Proposed California High-Speed Rail Project

The authors of *The Financial Risks of California's Proposed High-Speed Rail Project* released another report in June 2011. This report, entitled *Financial Analysis of The Proposed California High-Speed Rail Project*, measures the impact of four critical California high-speed rail project variables: 1) the decline, if not disappearance, of Federal grant money, 2) the near-certainty of increasing construction costs, 3) the certainty that cash-strapped cities and counties will not have money to contribute to the construction of the high-speed rail project, and 4) the high probability that the California High-Speed Rail Authority will not achieve its projected operating results. Using the Authority's business plan operating data, the forecasted financial results show insufficient monies from operations to service the construction debt. The burden of this debt will fall to the taxpayers, who will need to service it at the expense of priorities such as education and public safety.

Financial Analysis of the Proposed California High-Speed Rail Project - June 2, 2011 [CLICK HERE](#) (.pdf)

Executive Summary Of The Financial Analysis Report - June 17, 2011 [CLICK HERE](#) (.pdf)

### Briefing Papers

The authors of *The Financial Risks of California's Proposed High-Speed Rail Project* have released a series of Briefing Papers. Each Briefing Paper discusses one of the topics addressed in *The Financial Risks of California's Proposed High-Speed Rail Project*.

1. Dubious Ridership Forecasts - November 3, 2010 [CLICK HERE](#) (.pdf)
2. Six Myths Protecting California's High-Speed Rail Project - November 13, 2010 [CLICK HERE](#) (.pdf)
3. Executive Summary - November 30, 2010 [CLICK HERE](#) (.pdf)
4. A Train To Nowhere But Bankruptcy - January 3, 2011 [CLICK HERE](#) (.pdf)
5. Seven Deadly Financial Facts - January 18, 2011 [CLICK HERE](#) (.pdf)
6. Big Trouble For California's \$66 Billion Train - March 21, 2011 [CLICK HERE](#) (.pdf)
7. Will The High-Speed Train Benefit California's Middle Class? - April 4, 2011 [CLICK HERE](#) (.pdf)

### Briefing Notes

The authors of *The Financial Risks of California's Proposed High-Speed Rail Project* have released a series of one-page briefs addressing claims frequently made by proponents of the California High-Speed Rail project. Each Briefing Note counters a specific claim and contains extensive footnotes and quotations from various sources. The

## Community Coalition on High Speed Rail

Briefing Notes are focused on matters of subsidies, costs, jobs and other financial issues. They do not address local issues with the possible exception of matters related to imminent construction in the Central Valley.

1. ON THE LIKELIHOOD OF MORE FEDERAL CONSTRUCTION MONIES [CLICK HERE](#) (.pdf)
2. ON HIGH-SPEED RAIL RIDERS AND RIDERSHIP FORECASTS [CLICK HERE](#) (.pdf)
3. ON COSTY OVERRUNS WHILE BUILDING MEGAPROJECTS [CLICK HERE](#) (.pdf)
4. ON CONSTRUCTION JOBS IN THE HIGH-SPEED RAIL PROJECT [CLICK HERE](#) (.pdf)
5. ON PERMANENT JOBS CREATED BY THE HIGH-SPEED RAIL PROJECT [CLICK HERE](#) (.pdf)
6. ON HIGH-SPEED RAIL'S NEED FOR OPERATING SUBSIDIES [CLICK HERE](#) (.pdf)
7. ON PRIVATE CAPITAL FOR CALIFORNIA'S HIGH-SPEED TRAIN [CLICK HERE](#) (.pdf)
8. ON HIGH-SPEED RAIL TICKET PRICES VERSUS DRIVING [CLICK HERE](#) (.pdf)
9. ON CHSRA'S ASSUMED RAIL TICKET PRICES VERSUS AIRLINE FARES [CLICK HERE](#) (.pdf)
10. ON HIGH-SPEED RAIL'S FINANCIAL SHELL GAMES [CLICK HERE](#) (.pdf)
11. ON HIGH-SPEED RAIL'S PROBLEMS - DEJA VU ALL OVER AGAIN [CLICK HERE](#) (.pdf)
12. ON THE CHSRA'S ESTIMATED OPERATING EXPENSES [CLICK HERE](#) (.pdf)
13. ON THE CHSRA'S ESTIMATED OPERATING REVENUES [CLICK HERE](#) (.pdf)
14. ON EVIDENCE-BASED HIGH-SPEED RAIL FARES [CLICK HERE](#) (.pdf)
15. ON OPERATING COSTS OUT OF SYNC WITH THE FRA AND REALITY [CLICK HERE](#) (.pdf)
16. ON PHASE ONE'S COSTS, MARGINS AND ACCUMULATED DEBT OVER SIXTEEN YEARS [CLICK HERE](#) (.pdf)
17. ON THE 'ENTIRE SYSTEM'S' COSTS, MARGINS AND ACCUMULATED DEBT OVER THIRTY YEARS [CLICK HERE](#) (.pdf)
18. ON PRE-PHASE ONE CONSTRUCTION, MARGINS AND ACCUMULATED DEBT [CLICK HERE](#) (.pdf)
19. ON THE IMPACT ON THE STATE OF SERVICING DEBT ON THE 'ENTIRE SYSTEM' [CLICK HERE](#) (.pdf)
20. ON THE CONSEQUENCES OF THE INCREASING COST PER MILE IN THE CENTRAL VALLEY [CLICK HERE](#) (.pdf)
21. ON WHAT CAN ACTUALLY BE BUILT IN THE CENTRAL VALLEY [CLICK HERE](#) (.pdf)
22. ON CASH FROM OPERATIONS PAYING FOR HIGH-SPEED RAIL'S CONSTRUCTION [CLICK HERE](#) (.pdf)
23. ON A MOVE TO CHANGE HIGH-SPEED RAIL'S FINANCIAL PERFORMANCE METRICS [CLICK HERE](#) (.pdf)

### Follow the Money



Click on the icon to the left, to view a fifteen page, graphics-driven presentation on the numbers surrounding the California high-speed rail project as proposed by 2008's Proposition 1A. The presentation touches on everything from the likely construction costs and ridership numbers for the proposed high-speed system, to jobs and to the devastating impact on California's General Fund. The authors of this presentation have used it throughout California to educate elected officials and others. It is a useful tool for explaining the project to the financially inexperienced.

<http://www.cc-hsr.org/>

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012)

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### L005-1

Refer to Standard Response FB-Response-GENERAL-16, FB-Response-GENERAL-08, FB-Response-GENERAL-02.

The Authority has considered the feedback provided by the City during the design of the project and during the CEQA/NEPA process. However, the Authority is not required to make all or any of the changes that may be requested. The HST project is being undertaken by a state agency (the Authority) and a federal agency (the FRA). The project must conform to the policies and objectives of the statutes and regulations under which the Authority and FRA operate. The Authority and FRA cannot delegate their responsibilities under these statutes and regulations to any other agency.

### L005-2

None of the comments provided in this submission provides substantive evidence that the Revised DEIR/Supplemental DEIS underestimates the impacts of the project on the metropolitan Bakersfield area, as indicated in the responses to the comments in this submission.

The Revised DEIR/Supplemental DEIS provides an analysis of the construction and operation impacts that may reasonably be expected to occur with implementation of the proposed project.

### L005-3

Refer to Standard Response FB-Response-GENERAL-07, FB-Response-GENERAL-08, FB-Response-GENERAL-16.

### L005-4

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-27.

This submission contains no substantive evidence that the Revised DEIR/Supplemental DEIS is defective, as shown in the responses to the comments provided in the submission.

### L005-5

Refer to Standard Response FB-Response-GENERAL-07.

This submission contains no substantive evidence that the Revised DEIR/Supplemental DEIS is defective, as shown in the responses to the comments provided in the submission.

Abundant substantial evidence in the record demonstrates the project description was more than adequate for the environmental analysis of the project. The description of alternatives provides detailed information, like the horizontal and vertical location of track, cross sections of the infrastructure with measurements, precise station footprints with site configuration, and temporary construction staging sites and facilities. The description of alternatives provides a "project footprint" overlaid on parcel maps, which shows the outside envelope of all disturbance, including both permanent infrastructure and temporary construction activity. The project description provides 100% of the information that is required under CEQA Guidelines Section 1512447 (see Dry Creek, supra, 70 Cal.App.4th at pp. 27-36 [upholding EIR conceptual project description as inadequate when based on preliminary design]).

Section 3.3 of the EIR/EIS provides a complete analysis of region-wide and local air quality impacts associated with project construction and operation, including potential air quality impacts from increased vehicle traffic associated with the Bakersfield station alternatives. Measures to mitigate reduce significant air quality impacts are provided in Section 3.3.9.

Section 3.4 of the EIR/EIS identifies noise impacts on the Bakersfield community, and Section 3.4.9 provides mitigation measures to reduce significant noise impacts.

Section 3.6 of the EIR/EIS quantifies the energy requirements for project construction and operations and evaluates the ability of existing energy infrastructure to meet those energy demands. The project was determined not to result in significant energy impacts; therefore, no mitigation measures are proposed.

### L005-6

Refer to Standard Response FB-Response-GENERAL-07.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-7**

Refer to Standard Response FB-Response-GENERAL-01.

### **L005-8**

Refer to Standard Response FB-Response-GENERAL-13, FB-Response-GENERAL-01.

Substantial evidence shows that the Authority has properly tiered, not piecemealed, its environmental review. Based on two first-tier program EIRs, the Authority selected track technology, general track alignments, and preferred station locations. Subsequently, the Authority divided the HST System into geographically smaller pieces, called HST sections, for second-tier EIRs. Moving from a first-tier project to a more limited geographic scope second-tier project is precisely what tiering is for (Pub. Res. Code §21093; Guidelines §15152). At a practical level, the HST System is simply too big to be addressed in a single second-tier EIR, or even just two or three. It was within the Authority's discretion to define the second-tier projects, and the only question is whether the Authority's division of the second-tier projects is supported by substantial evidence. The record shows it is.

The Authority originally defined a single project and EIR for Merced to Bakersfield, but later revised it into two second-tier projects—the Merced to Fresno (65 miles) and Fresno to Bakersfield (114 miles) sections, both of which include portions of the proposed Initial Construction Section (ICS). This comment indicates the project should have stayed as Merced to Bakersfield, but the smaller project definition was reasonable. Each project has logical termini at cities selected to have HST stations at the first tier, has sufficient length to allow for an analysis of environmental impacts on a broad scope, and has independent utility separate and apart from any other section (see *Del Mar Terrace Conservancy, Inc. v. City Council of the City of San Diego* (1992) 10 Cal.App.4th 712, 733 [upholding EIR that treated as the "project" at issue one freeway segment within a long-term, multi-segment regional plan]).

Testing high-speed trains on the ICS would have no different impacts than operating high-speed trains on the ICS. The impacts of HST operations are addressed in the Fresno to Bakersfield EIR/EIS.

### **L005-9**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-21, FB-Response-HWR-01, FB-Response-HWR-02, FB-Response-PU&E-01.

The Authority and FRA have followed the procedural and substantive requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). No factual information has been provided in this comment to indicate that the procedures and requirements of NEPA and CEQA were not followed in the environmental review process for the Fresno to Bakersfield Section of the HST System.

An EIR project description is intended to be general, not detailed (CEQA Guidelines § 15124[c]). Final design—or even advanced design—of infrastructure is not required in the project description (*Dry Creek Citizens Coalition v. County of Tulare* [1999] 70 Cal.App.4th 20, 36). Abundant substantial evidence in the record demonstrates that the project description in the EIR/EIS is more than adequate. The term "15% design" is an engineering term of art that refers to the level of engineering prepared on HST project elements for the EIR/EIS. The 15% design generates detailed information, like the horizontal and vertical location of track, cross sections of the infrastructure with measurements, precise station footprints with site configuration, and temporary construction staging sites and facilities such as concrete batch plants. The 15% design also yields a "project footprint" overlaid on parcel maps; the project footprint shows the outside envelope of all disturbance, including both permanent infrastructure and temporary construction activity. This 15% design translated into a project description in the EIR/EIS with 100% of the information that is required under CEQA Guidelines Section 1512447 (see *Dry Creek*, above, 70 Cal.App.4th at pp. 27-36 [upholding EIR conceptual project description as inadequate when based on preliminary design]).

Environmental impacts are presented in Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures, of the Final EIR/EIS for the Fresno to Bakersfield Section. The analysis allows for comparison of impacts by alternative. With the various alternative alignments considered for the project, there are a total of 72 alternative ways for a single alignment to run from Fresno to Bakersfield. Providing an individual analysis of all 72 alternatives would have made the document unreadable. To provide information to compare alternatives in as concise a format as

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-9

possible, the impacts of a single alternative from Fresno to Bakersfield, termed the BNSF Alternative, was described first. This description was followed by a description of the impacts of each of the other individual alternative segments (e.g., Hanford West Bypass and Allensworth Bypass alternatives) and a comparison of the difference in impacts between that alternative segment and the corresponding segment of the BNSF Alternative. In this way, a reader can quickly understand the implications of taking either the BNSF Alternative or one of the alternative segments for the particular environmental topic being evaluated.

As discussed in "NEPA's Forty Most Asked Questions," "Section 1502.14(e) [40 CFR 1502.14(e)] requires the section of the EIS on alternatives to 'identify the agency's preferred alternative if one or more exists, in the draft statement, and identify such alternative in the final statement . . .'. This means that if the agency has a preferred alternative at the Draft EIS stage, that alternative must be labeled or identified as such in the Draft EIS. If the responsible federal official in fact has no preferred alternative at the Draft EIS stage, a preferred alternative need not be identified there. By the time the Final EIS is filed, Section 1502.14(e) presumes the existence of a preferred alternative and requires its identification in the Final EIS 'unless another law prohibits the expression of such a preference.'" (CEQ n.d. [<http://ceq.hss.doe.gov/nepa/regs/40/1-10.HTM#4>]).

Neither the Authority nor FRA had selected a "Proposed Project" under CEQA or a "Preferred Alternative" under NEPA at the time the Draft EIR/EIS or the Revised DEIR/Supplemental DEIS was circulated. As required by NEPA, all alternatives carried through the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS were described in sufficient detail to evaluate the potential impacts of each alternative.

Descriptions and figures of the three proposed Bakersfield Station locations and associated facilities are provided in Section 2.4, Alignment, Station, and Heavy Maintenance Facility Alternatives Evaluated in this Project EIR/EIS, of the Final EIR/EIS.

With regard to transmission lines, please refer to Standard Response FB-Response-PU&E-01.

### L005-9

With regard to irrigation and drainage facilities, please refer to Standard Responses FB-Response-HWR-01 and FB-Response-HWR-02.

Descriptions of new or modified bridges over streams and rivers are provided by alternative in Section 2.4, Alignment, Station, and Heavy Maintenance Facility Alternatives Evaluated in this Project EIR/EIS, of the Final EIR/EIS.

Modified freeway interchanges, road closures, and proposed modifications to existing roadways, including overcrossings and underpasses are included in Section 2.4.5, Modification of Caltrans/State Facilities, of Volume 1 of the Final EIR/EIS and Appendix 2-A, Road Crossings, of Volume 2, Technical Appendices, of the Final EIR/EIS.

Neither CEQA nor NEPA mandates the disclosure of impacts on individual properties, as long as sufficient information is provided to adequately characterize overall environmental impacts. This rule applies to any EIR/EIS, whether characterized as a "program" document or a "project" document. For example, CEQA Guidelines Section 15151 states:

"An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."

### L005-10

Refer to Standard Response FB-Response-GENERAL-22, FB-Response-BIO-03.

For a project such as the HST project that would not commence operation for approximately 10 years and would not reach full operation for approximately 25 years, use of only existing conditions as a baseline for traffic level-of-service (LOS) impacts would be misleading. It is substantially more likely that existing background traffic

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-10**

volumes (and background roadway changes due to other programmed traffic improvement projects) will change between today and 2020/2035 than it is for existing traffic conditions to remain precisely unchanged over the next 10 to 25 years. For example, as stated in Section 3.2.5.1, Regional Transportation Plans (RTPs) include funded transportation projects that are programmed to be constructed by 2035. Ignoring the fact that these projects would be in place before the HST project reaches maturity (i.e., the point/year at which HST-related traffic generation would reach a maximum), and evaluating the HST project's traffic impact without recognizing that the RTP improvements would change the underlying background conditions to which HST project traffic would be added, would create a hypothetical comparison and, for these reasons, would be misleading.

Transportation-related impacts that are not LOS-based, such as road closures, are evaluated only against existing conditions. The criteria for impact analysis of road closures is out-of-direction travel, which is measured by distance. Since distance impacts are a finite measurement, conditions would be the same under existing or future conditions.

### **L005-11**

Refer to Standard Response FB-Response-GENERAL-01.

The evidence requested for specific analyses are provided in the specific comments included in the City of Bakersfield's Supplement A.

The Fresno to Bakersfield Section EIR/EIS covers the entire alignment through the City of Bakersfield. Oswell Street, the terminus of the environmental analysis in the EIR/EIS, is approximately 1.5 miles east of the city limits.

### **L005-12**

Refer to Standard Response FB-Response-GENERAL-01.

The referenced Mitigation Measure SO-MM #3 provides performance criteria for replacement of properties displaced by the HST. This is an acceptable mitigation measure under CEQA and NEPA when the proposed mitigation is known to be feasible.

### **L005-12**

Replacement of physical facilities is feasible. The mitigation measure does not need to identify the details of how each facility will be replaced.

In accordance with CEQA requirements, the Authority has evaluated mitigation measures proposed by the public or responsible agencies and for those mitigation measures not adopted, the reasons for not adopting them are provided. This information is provided in the Final EIR/EIS.

In accordance with Section 15097 of the CEQA Guidelines, the Authority will prepare a Mitigation Monitoring and Enforcement Plan prior to project approval. This plan will identify the implementing party, monitoring/reporting party, mitigation timing, and implementation mechanism or tool for each mitigation measure.

### **L005-13**

Refer to Standard Response FB-Response-BIO-02, FB-Response-GENERAL-01.

Traffic associated with the HST station alternatives would significantly impact 16 intersections in Bakersfield. As listed in Table 3.2-15 of the EIR/EIS, the impacts at 9 of these intersections can be mitigated to a level of less-than-significant by improvements such as adding signals, retiming existing signals, and restriping. These are typically improvements that do not result in unavoidable, significant environmental impacts because they do not require physical modifications to the roadway. Depending on the alternative HST station selected, up to 7 intersections would require widening one of the approaches to provide an additional turn lane or through lane (Truxtun Avenue/Tulare Street, Union Avenue/E. Brundage Lane, Liggett Street/E. Brundage Lane, Union Avenue/California Avenue, Union Avenue/Golden State Avenue/21st Street/Q Street/Golden State Avenue, and M Street/28th Street/Golden State Avenue). These modifications can be completed within the existing public right-of-way; therefore, there would no significant long-term impacts.

The location of sound walls is provided in the engineering drawings in Volume III of the EIR/EIS. Those walls would be constructed within the HST right-of-way. The analysis of sound wall construction impacts is encompassed by the construction impact analysis for the HST system.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-14**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-02, FB-Response-GENERAL-25.

The Statewide Program EIR/EIS for the California HST System (Authority and FRA 2005) considered transportation modes to improve intercity travel in California, technologies for an HST System, and alternative alignments through and around Bakersfield. As indicated in Standard Response FB-Response-GENERAL-25, the City of Bakersfield was heavily involved in the evaluation of alternative alignments and stations in Bakersfield.

As shown on Figure 2.6-13 in Section 2.6 of the Statewide Program EIR/EIS (Authority and FRA 2005), the Authority considered four general alignment corridors through and around Bakersfield and seven station alternatives within Downtown Bakersfield and on the outskirts of Bakersfield. After consideration of information developed by the Authority and an extensive study conducted by the Kern Council of Governments, the City of Bakersfield selected an alternative station location in Downtown Bakersfield near the existing Amtrak station. Although the City of Bakersfield did not provide a comment letter on the Statewide Program Draft EIR/EIS, it is assumed that the opinion of the City of Bakersfield concerning the alternative alignments followed that of Kern County: there was no preference for an alternative alignment as long as that alignment supported a station in Downtown Bakersfield near the existing Amtrak station.

The Authority and FRA selected the BNSF Railway (BNSF) corridor as the preferred corridor for an HST alignment in the Fresno to Bakersfield Section. At the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments (COG), the Authority and FRA selected a station location in Bakersfield in the vicinity of the existing Amtrak station. Tiering off of the decisions made on the Program EIR/EIS and supported by the City of Bakersfield, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF corridor, with alternative station locations in the vicinity of the existing Amtrak station.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS for the Fresno to Bakersfield Section, the Authority implemented an

### **L005-14**

alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

Three types of HST technology were analyzed for the Statewide Program EIR/EIS. These three technologies were Steel-Wheel-on-Steel-Rail at Lower Speed (below 200 miles per hour [mph]); Magnetic Levitation Technology (maglev); and Steel-Wheel-on-Steel-Rail at Very High Speed (VHS) (above 200 mph). The Authority's enabling legislation, Senate Bill (SB) 1420 (chaptered September 24, 1996, Chapter 796, Statute of 1996) defines high-speed rail as "intercity passenger rail service that utilizes an alignment and technology that makes it capable of sustained speeds of 200 mph (320 kph [kilometers per hour]) or greater." Therefore, technologies below 200 mph were eliminated from further consideration. This direction is consistent with foreign HST experience, the experience of the northeast corridor (Boston–New York–Washington, D.C.), and HST studies done elsewhere in the United States, which show that to compete with air transportation and generate high ridership and revenue, the intercity HST travel times between the major transportation markets must be below 3 hours.

From this determination, the California Intercity High-Speed Rail Commission directed staff to focus technical studies on VHS (Steel-Wheel-on-Steel-Rail at Very High Speeds [above 200 mph]) and maglev technologies. Although a completely dedicated train technology using a separate track/guideway would be required on the majority of the proposed system using both technologies, requiring such separation everywhere in the system would prohibit direct HST service to certain heavily constrained terminus sections (e.g., the San Francisco Peninsula from San Jose to San Francisco and the existing rail corridor between Los Angeles Union Station and Orange County). Because of extensive urban development and severely constrained right-of-way, HST service in these terminus sections would need to share physical infrastructure (tracks) with existing passenger rail services in existing or slightly modified corridors. A maglev system, in addition to being a more costly technology, would require separate and distinct guideway configurations that preclude the sharing of rail infrastructure. Because a dedicated (exclusive guideway) high-speed rail service along existing right-of-way corridors in all segments of the system would be infeasible, use of maglev technology

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-14**

for portions of the project would preclude direct HST service without passenger transfer and would not satisfy travel time requirements of the project purpose and need.

Other rail transportation configurations, including monorail, were eliminated from further consideration for not meeting this basic system requirement. A VHS system would be compatible with other trains sharing the tracks. The potential for utilization of shared track allows for individual project segments to meet independent utility requirements. By comparison, maglev technology does not lend itself to incremental improvements and could not satisfy independent utility requirements or meet the project's blended system approach. By taking advantage of the existing rail infrastructure, a shared-use configuration would be mostly at-grade. Shared-use options are less costly and would result in fewer environmental impacts compared with exclusive guideway options. Also, improved regional commuter service (electrified, fully grade-separated, with additional track and security features) would help mitigate the impacts along existing rail corridors.

Shared-use improvements in these corridors would potentially improve automobile traffic flow at rail crossings and reduce noise impacts, because a grade-separated system could eliminate trains blowing warning horns throughout the alignment. Shared-use options would provide the opportunity for a partnership with right-of-way owners and commuter rail operators and would provide the opportunity to incrementally improve network segments. For these reasons, maglev technology was eliminated from further investigation in the Final Program EIR/EIS, is not part of the project description, and does not require further consideration in this project-level EIR/EIS.

### **L005-15**

Responses to comments made on the Draft EIR/EIS are provided in Volume IV of this Final EIR/EIS. Responses to comments on the Revised DEIR/Supplemental DEIS are provided in Volume V of this Final EIR/EIS. All responses to comments on significant environmental issues are detailed, reasoned, and provided in good faith.

### **L005-16**

Refer to Standard Response FB-Response-GENERAL-27.

The Authority has provided meaningful responses to the City of Bakersfield's comments.

### **L005-16**

None of these comments warrants recirculation of the document.

### **L005-17**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-02, FB-Response-GENERAL-07, FB-Response-GENERAL-22.

a. The Revised DEIR/Supplemental DEIS is large because the project is unusually large. The City of Bakersfield must understand the difficulty of meeting the suggested page limits for an EIR. For example, the EIR/EIS that the City of Bakersfield published for the Alta East Wind Energy Project, which is substantially smaller in area and complexity than the high-speed train project, is over 900 pages without the hundreds of pages of technical reports and appendices. The technical reports for the Fresno to Bakersfield Section EIR/EIS are appropriately referenced. None of the comments provided by the City of Bakersfield provides substantive evidence that they are not.

b. Baseline conditions provided in the EIR/EIS are not unsupported. Baseline information is based on field studies where access was possible, published information, available databases, and information provided by local agencies and jurisdictions. None of the comments provided by the City of Bakersfield provides substantive evidence that baseline conditions are not reported adequately for an understanding of the nature and magnitude of environmental impacts.

c. This comment first suggests that the Revised DEIR/Supplemental DEIS had to identify a preferred alternative. This assumption has no basis in the law. While a typical draft EIR includes a "proposed project" studied in detail and "range of reasonable alternatives" that receive less scrutiny, nothing in CEQA prohibits a lead agency from analyzing all alternatives with equal detail, or from obtaining public input on a draft EIR before selecting a preferred alternative to identify in a final EIR (Guidelines §15126.6(a)). The EIR here is a joint EIR/EIS, and it had to comply with the more rigorous NEPA standard to "devote substantial treatment to each alternative" (40 CFR §1502.14; COOI407-08 [explaining approach to preferred alternative].) By obtaining public input before designating a preferred alternative, the EIR was not only consistent with CEQA, it offered more analysis and input, not less, than CEQA requires (Guidelines §15222).

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-17

This comment goes no to state that the alternative alignments are poorly defined. The alignments are defined in substantial detail. A general description of those alignments is provided in Chapter 2. Detailed maps showing the footprint of each alternative are provided in Appendix 3.1-A of the EIR/EIS.

d. Substantial evidence shows that the Authority has properly tiered, not piecemealed, its environmental review. Based on two first-tier program EIRs, the Authority selected track technology, general track alignments, and preferred station locations. Subsequently, the Authority divided the HST System into geographically smaller pieces, called HST sections, for second-tier EIRs. Moving from a first-tier project to a more limited geographic scope second-tier project is precisely what tiering is for (Pub. Res. Code §21093; Guidelines §15152). At a practical level, the HST System is simply too big to be addressed in a single second-tier EIR, or even just two or three. It was within the Authority's discretion to define the second-tier projects, and the only question is whether the Authority's division of the second-tier projects is supported by substantial evidence. The record shows it is.

The Authority originally defined a single project and EIR for Merced to Bakersfield, but later revised it into two second-tier projects—the Merced to Fresno (65 miles) and Fresno to Bakersfield (114 miles) sections, both of which include portions of the proposed Initial Construction Section (ICS). This comment indicates the project should have stayed as Merced to Bakersfield, but the smaller project definition was reasonable. Each project has logical termini at cities selected to have HST stations at the first tier, has sufficient length to allow for an analysis of environmental impacts on a broad scope, and has independent utility separate and apart from any other section (see *Del Mar Terrace Conservancy, Inc. v. City Council of the City of San Diego* (1992) 10 Cal.App.4th 712, 733 [upholding EIR that treated as the "project" at issue one freeway segment within a long-term, multi-segment regional plan]).

e. As shown in the response to specific comments provided by the City of Bakersfield, the EIR/EIS neither defers impact analysis nor mitigation measures.

f. The Authority has provided a reasonable range of alternatives to meet the purpose

### L005-17

and need for the project.

g. A list of relevant past, present, and probable future projects used in the analysis of cumulative impacts is provided in Appendices 3.19-A and 3.19-B. This list encompasses those projects relevant at the time the Notice of Preparation was published for the EIR/EIS.

### L005-18

Refer to Standard Response FB-Response-GENERAL-07.

### L005-19

Refer to Standard Response FB-Response-GENERAL-16.

Public notification exceeded the basic requirements of both CEQA and NEPA, which do not mandate direct notice to individual property owners. Further, in order to provide the public with more information than is generally available in an EIR or EIS, the Draft EIR/EIS and Revised DEIR/Supplemental DEIS included maps of the entire alignment of each of the alternatives within the approximately 114-mile-long Fresno to Bakersfield Section (see Volume II, Appendix 3.1), with individual parcels identified by Assessor's Parcel Number. This is an unprecedented level of detail for a project of this length and provided interested property owners the opportunity to determine how their properties might be affected by the project. The alternative routes were identified on the maps to enable property owners to see which alternative would potentially affect their property.

In addition, draft maps of the proposed alignment alternatives were provided in a number of ways other than the Alignment Parcels section of the Revised DEIR/Supplemental DEIS. At each workshop and public hearing, large roll maps were provided with staff to assist affected property owners in identifying their property and alignment proximity. In addition, draft maps have consistently been provided and updated on the Authority's website as the project has progressed. In addition, stakeholders who requested specific maps or proximity identification were either sent these maps or called by a right-of-way acquisition specialist who could assess impacts.

The level of detail in the maps is commensurate with the level of design of the project.

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Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**L005-19**

Maps have been available to the public since the release of the Draft EIR/EIS in 2011. The Revised DEIR/Supplemental DEIS includes design refinements that have been made since the release of the Draft EIR/EIS.

**L005-20**

Refer to Standard Response FB-Response-GENERAL-21, FB-Response-PU&E-01, FB-Response-PU&E-02.

The Authority and FRA have followed the procedural and substantive requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). No factual information has been provided in this comment to indicate that the procedures and requirements of NEPA and CEQA were not followed in the environmental review process for the Fresno to Bakersfield Section of the HST System.

An EIR project description is intended to be general, not detailed (CEQA Guidelines § 15124(c)). Final design or even advanced design of infrastructure is not required in the project description (*Dry Creek Citizens Coalition v. County of Tulare* [1999] 70 Cal.App.4th 20, 36). Abundant substantial evidence in the record demonstrates that the project description in the EIR/EIS is more than adequate. The term "15% design" is an engineering term of art that refers to the level of engineering prepared on HST project elements for the EIR/EIS. The 15% design generates detailed information, like the horizontal and vertical location of track, cross sections of the infrastructure with measurements, precise station footprints with site configuration, and temporary construction staging sites and facilities. The 15% design also yields a "project footprint" overlaid on parcel maps; the project footprint shows the outside envelope of all disturbance, including both permanent infrastructure and temporary construction activity. This 15% design translated into a project description in the EIR/EIS with 100% of the information that is required under CEQA Guidelines Section 15124 (see *Dry Creek*, above, 70 Cal.App.4th at pp. 27-36 [upholding EIR conceptual project description as adequate when based on preliminary design]).

With regard to identification of alternatives, Chapter 2, Alternatives of the Final EIR/EIS was revised on page 2-29 to clearly state that DE-S is the BNSF Alternative and D2-N is the Bakersfield South Alternative. The second page of Volume 3, Alignments and Other

**L005-20**

Plans, is a general sheet with a schematic of the alignment segments that shows that B1 is the Bakersfield South Alternative, B2 is Bakersfield North or the BNSF Alternative, and B3 is the Bakersfield Hybrid Alternative. Section 2.4.4.3, Bakersfield Station Alternatives, of the Final EIR/EIS also calls out each station alternative relative to its alignment alternative.

**L005-21**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-22, FB-Response-SO-08.

Neither the California Environmental Quality Act (CEQA) nor the National Environmental Policy Act (NEPA) mandates the disclosure of impacts on individual properties as long as sufficient information is provided to adequately characterize the overall environmental impact. This requirement applies to any EIR/EIS, whether characterized as a "program" document or a "project" document. For example, CEQA Guidelines Section 15151 states:

"An EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."

With regard to the commenter's claim that the EIR/EIS fails to adequately analyze project impacts to city resources and infrastructure, in fact impacts to important facilities in Bakersfield are recognized in Impact SO#6, Disruption to Community Cohesion or Division of Existing Communities from Project Operation, in Section 3.12, Socioeconomics, Communities, and Environmental Justice, of the Final EIR/EIS. Although not every affected facility along the entire alignment is specifically called out, several of the facilities identified by the commenter are identified, including displacement of government facilities, as discussed below.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-21

#### *6a. The City's Corporation Yard*

The impact to the City of Bakersfield's corporation yard is included in the discussion of Impact SO#6 in Section 3.12, Socioeconomics, Communities, and Environmental Justice, of the Final EIR/EIS. Please refer to Mitigation Measure SO-3, Implement Measures to Reduce Impacts Associated with the Relocation of Important Facilities. These measures will apply to all schools, churches, city and county property, and other important facilities displaced in Bakersfield. The Authority will consult with these respective parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services and also to ensure that the relocation allows the community currently served to continue to access these services. Mitigation Measure SO-3 will be effective in minimizing the impacts of the project because it calls for completing new facilities before necessary relocations and because it involves affected facilities in the process to identify new locations for their operations. The Authority, as required under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act) and the Community Relocation Assistance Act (CRAA), bears the cost of compensation for displaced public infrastructure. Relocation of the Corporation Yard is required for the Bakersfield South and Bakersfield Hybrid alternatives but not for the BNSF alternative.

#### *6b. Parking Facilities for City Personnel and Rabobank Arena*

Impacts to the Bakersfield Convention Center overflow parking lot are discussed in Impact TR#13, Impacts on the Local Roadway Network due to Station Activity, in Section 3.2, Transportation, of the Final EIR/EIS. The Bakersfield Convention Center overflow lot has a total of 660 parking spaces; 332 parking spaces (50.3%) would be removed for the BNSF Alternative, 482 parking spaces (73%) would be removed for the Bakersfield South Alternative, and 423 parking spaces (64.1%) would be removed for the Bakersfield Hybrid Alternative. To minimize the potential for permanent parking loss affecting this facility's ability to meet the City of Bakersfield's minimum parking requirements, the Authority will ensure that existing parking that is removed is replaced so that all existing parking demand is met with off-street parking. Parking replacement will be achieved through the utilization of existing vacant lots in close vicinity to this facility or dedicated shared use of parking spaces constructed as part of the Bakersfield

### L005-21

HST Station. This effect would have negligible intensity under NEPA and would be a less-than-significant impact under CEQA. Consequently, no effects on City personnel or the ability of the Bakersfield Convention Center to hold events would occur.

#### *6c. Bakersfield High-School Facilities*

The Bakersfield Hybrid Alternative was developed based on substantive comments received during the public and agency review of the Draft EIR/EIS. The Bakersfield Hybrid Alternative would require reduced speeds, which would impact the overall travel times mandated by the California State Legislature. However, this alternative would have the advantage of avoiding the Bakersfield High School campus and would reduce the number of religious facilities and homes impacted in east Bakersfield. Please refer to Section 3.12, Socioeconomics, Communities, and Environmental Justice, of the Final EIR/EIS for more detail. The environmental impacts associated with the three alternatives through the Bakersfield area are discussed in detail in each resource section in Chapter 3 (i.e., Section 3.2, Transportation; Section 3.3, Air Quality and Global Climate Change; Section 3.4, Noise and Vibration; etc.). Please also refer to Standard Response FB-Response-SO-08.

#### *6d. Westside Parkway*

The Authority and the City of Bakersfield Department of Public Works have reviewed the plans for the HST alternatives relative to the Westside Parkway in December 2012, and both the Authority and the City determined that none of the HST alternatives would have major impacts on the construction of the Westside Parkway. The construction of the Westside Parkway is now substantially complete. The Fresno to Bakersfield HST project Alignments B2 (Bakersfield South) and B3 (Bakersfield Hybrid) would require the relocation of the existing off-ramp to Brimhall Ave/Coffee Rd to the North.

It is recognized that traffic and operations of portions of the Westside Parkway/Centennial Corridor will be temporally affected during the HST foundation and straddle bent construction. All alternatives would require temporary traffic detours or short-term closures to install HST foundations outside the travel way, straddle bent support across the Westside Parkway, and steel trusses over Truxtun Avenue.

As discussed in Section 3.11, Safety and Security, of the Final EIR/EIS, a basic design

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-21

feature of an HST System is to contain the trainsets within the operational corridor (FRA 1993). Strategies to ensure containment include operation and maintenance plan elements that would ensure high-quality tracks and vehicle maintenance to reduce the risk of derailment. Also, physical elements, such as containment parapets, check rails, guard rails, and derailment walls, would be used in specific areas with a high risk of or high impact from derailment, such as where the HST elevated structure would cross the Westside Parkway. Therefore, the risk of accidents involving the HST project and motorists on the Westside Parkway is judged to be low, as is the risk of vehicle accidents between roadways crossing over each other, which is common on the freeways in California.

The visual impacts of the HST elevated structure are discussed in Section 3.16.5, Environmental Consequences, of the Final EIR/EIS. Between Coffee Road and the crossings over the Kern River east of the Mohawk Street Bridge, the HST alignments and Westside Parkway would broadly parallel one another. The HST project would cross over the Westside Parkway at three (BNSF Alternative) or four (Bakersfield South and Hybrid alternatives) locations. From an aesthetic perspective, these crossings are not expected to result in any substantial adverse impacts. The crossings would resemble instances of freeways passing over roadways on elevated structures, a common occurrence in Bakersfield and elsewhere. Most of these crossings would take place in the area south of the Shell Refinery in an area of extremely poor existing visual quality. At both river crossings, the HST alignments would not pass over the proposed Westside Parkway bridges over the Kern River, crossing on the landward side of the bridge structures in each case. Thus, no direct physical or aesthetic conflict between the structures would be expected. The effects of the elevated structures on the Bakersfield landscape are described in detail and represented with simulations in Section 3.16, Aesthetics and Visual Resources, in the Final EIR/EIS. An extensive set of mitigation and design measures are proposed for these structures, to be developed in detail in coordination with the City of Bakersfield (refer to pages 3.16-140 to 3.16-143 in Section 3.16.7.2, Project, of the Final EIR/EIS).

#### *6e. Centennial Corridor Project*

The Fresno to Bakersfield HST project would not preclude the California Department of Transportation (Caltrans) and the City of Bakersfield from constructing the alternative for

### L005-21

the Centennial Corridor Project. On November 15, 2012, Caltrans announced the recommendation of Alternative B as the preferred alternative for the Centennial Corridor Project.

The City of Bakersfield Public Works Department and engineers with the Authority met in December 2012 to review the engineering plans for the project alternatives provided in Volume III of the Revised DEIR/Supplemental DEIS in relation to plans for infrastructure projects planned and in progress in Bakersfield, including the Centennial Corridor Project. The City of Bakersfield identified major conflicts between the HST project alternatives and the Centennial Corridor Project at that time. The design of all of the HST alternatives in Bakersfield has been progressed to minimize conflicts with and impacts on Alternative B of the Centennial Corridor, as well as the constructed Westside Parkway. It is recognized that various sections of the Westside Parkway/Centennial Corridor will be temporally affected during the HST foundation and straddle bent construction. Project coordination is ongoing and will continue as the designs progress concurrently.

#### *6f. South Mill Creek Redevelopment Project*

Direct impacts on the South Mill Creek project have been accounted for in the quantitative analysis presented in Section 3.12.8.2, High-Speed Train Alternatives, of the Final EIR/EIS.

### L005-22

Refer to Standard Response FB-Response-N&V-05, FB-Response-GENERAL-01.

Some of the proposed mitigation measures would occur on property the Authority would not own as part of its right-of-way acquisitions. These are sometimes referred to as "offsite" mitigation. Mitigation that would occur on property not owned by the Authority would require working with the property owners involved or with the jurisdiction that regulates the property in order to accomplish that mitigation. Therefore, although the Authority is committed to that mitigation, it cannot fully guarantee that it will be implemented because the final decision is outside the Authority's control. Refer to Section 3.1.4 of the Revised DEIR/Supplemental DEIS.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-22

The transportation analysis (Section 3.2) identifies various traffic improvement mitigation measures to occur along the HST alignment. These measures include, for example, installing new traffic signals, modifying lane widths, and adding lanes and turn pockets. In most cases, the roadways and intersections on which mitigation is proposed are owned and controlled by local governments. The Authority intends to work cooperatively with local governments along the HST alignment to confirm that the Authority can implement all traffic mitigations/improvements. A local government might, however, find a particular traffic improvement undesirable, and the Authority does not have jurisdiction to require a local government to accept such a measure. As a result, it is theoretically possible that some traffic impacts could go unmitigated or not fully mitigated (i.e., result in a significant and unavoidable impact). This result is considered unlikely because it is anticipated that local governments would prefer traffic mitigation over traffic congestion and would work with the Authority to implement traffic mitigation. The Authority has continued to work with local governments to confirm that traffic mitigation meets the identified performance standards in Section 3.2, Transportation, and can be accomplished.

Other "offsite" mitigation measures that will require working with public and private property owners include, for example, noise insulation at private residences or public buildings; relocation of utilities; shielding of UPRR and BNSF signaling systems; preservation, restoration, or creation of biological resources; conservation of agricultural lands through conservation easements; new plantings (for visual screening) outside of the HST project right-of-way; and relocation of historical structures. The Authority cannot force these property owners to accept mitigation measures; however, by providing funding to willing sellers in selected instances (such as for the acquisition of agricultural conservation easements or for habitat restoration), it is considered likely that the mitigation can be accomplished.

### L005-23

Refer to Standard Response FB-Response-GENERAL-01.

There is no conflict between air quality and noise mitigation measures. The comment errs in asserting that the HST Project is required to adhere to the city's noise ordinance. It does not. As described in mitigation measure N&V-MM#3, there are numerous

### L005-23

mitigation measures available to the construction contractor to reduce noise levels of many types of construction activities to those noise standards provided in the Bakersfield General Plan Noise Element.

The two bullets relating to energy use reflect minor errors in the text that have been corrected in the Final EIR/EIS. The analysis stating an increase in electric energy consumption has been changed to reflect that an increase of approximately 28,404 MMBtu per day, or less than 1.5% of statewide consumption under the 50% fare scenario and less than 1% of statewide consumption under the 83% fare scenario. Also, reference to the 2008 Bay Area to Central Valley Program EIR/EIS (Authority and FRA 2008) will be made, versus the 2005 Statewide DEIR/EIS (Authority and FRA 2005), to clarify which of the two prior EIR/EISs is being referenced.

The title of Table 3.3-7 has been changed in the Final EIR/EIS to more clearly describe its content. There is no air quality appendix to the EIR/EIS.

### L005-24

The Statement of Overriding Considerations is prepared in support of Board certification of the Final EIR/EIS as required by CEQA. It is not presented in the Draft EIR/EIS or Revised DEIR/Supplemental DEIS.

### L005-25

Refer to Standard Response FB-Response-SO-07.

The Authority and FRA have undertaken substantial outreach to environmental justice communities. Materials translated into Spanish included the Executive Summary, Notice of Preparation, a Revised DEIR/Supplemental DEIS overview brochure, fact sheets and comment cards at the public workshops and hearings. In addition, a multilingual, toll-free hotline was made available for public comments and requests. Spanish-speaking staff were available at all public workshops and hearings and wore badges saying "Habla Espanol" ("I speak Spanish") for easy visibility. Signs reading "Servicios de Traducción Están Disponibles" ("Translation services are available") were posted throughout the meeting space, directing participants to the appropriate staff. Translation services were made available at the public workshops and hearings, where opening remarks were

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Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**L005-25**

made in Spanish. Additionally, in an effort to address concerns about information being available, information about the California High-Speed Rail Authority Title VI Plan has been added to Section 3.12.2, Socioeconomics, Communities, and Environmental Justice, to describe the project benefits, regional and localized effects, and project impacts. Mitigation measures are intended to reduce impacts on environmental justice communities through additional design modifications to reduce visual impacts. Additional outreach will also take place. These measures augment, but do not replace, the outreach undertaken prior to and during the review period of the Draft EIR/EIS and Revised DEIR/Supplemental DEIS.

**L005-26**

The Authority has offered matching funds to local agencies for station area planning. The Authority has signed an agreement with, and is providing funding and technical assistance to, the City of Fresno for development of a station area plan that reflects the Authority's General Principles and Guidelines. The Authority is still open to providing funding to the City of Bakersfield if the city applies. HST station area development principles do not apply to the Kings/Tulare Regional Station sites.

**L005-27**

The Revised DEIR/Supplemental DEIS contains information on the Centennial Corridor as it existed at the time the notice of preparation was prepared in accordance with Section 15125 of the CEQA Guidelines. The City of Bakersfield Public Works Department and engineers with the Authority met in December 2012 to review the engineering plans for project alternatives provided in Volume III of the Revised DEIR/Supplemental DEIS in relation to plans for infrastructure projects planned and in progress in Bakersfield, including the Centennial Corridor Project. The design of all of the HST alternatives in Bakersfield has been progressed to minimize conflicts and impacts to Alternative B of the Centennial Corridor, as well as the constructed Westside Parkway. It is recognized that various sections of the Westside Parkway/Centennial Corridor will be temporally affected during the HST foundation and straddle bent construction. Project coordination is ongoing and will continue as the designs for HST and Centennial Corridor progress concurrently.

**L005-28**

Refer to Standard Response FB-Response-GENERAL-01.

**L005-29**

Refer to Standard Response FB-Response-GENERAL-25.

The procedural requirements for the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) were followed during the environmental review for the Fresno to Bakersfield Section of the HST System.

As described in Section 1.5, Tiering of Program EIR/EIS Documents, of the Final EIR/EIS, in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA 2005), the Authority and FRA selected the BNSF Railway (BNSF) route as the Preferred Alternative for the HST System between Fresno and Bakersfield. Therefore, the project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF corridor.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF corridor.

The station locations are designed primarily to tie into the existing transportation network. City centers are where existing transit facilities are, and typically city centers have good connections to the existing highway system. The Authority has not ignored the City of Bakersfield's concerns and suggestions. Input from the City of Bakersfield has been taken into consideration in project planning since the project was initiated. The Bakersfield Station was located in Downtown Bakersfield adjacent to the Amtrak station at the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments. The Revised DEIR/Supplemental DEIS was modified to include

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-29

information provided by the City of Bakersfield.

### L005-30

Refer to Standard Response FB-Response-GENERAL-25.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF Railway (BNSF) corridor.

With regard to identification of alternatives, Chapter 2, Alternatives, of the Revised DEIR/Supplemental DEIS was revised on page 2-29 to clearly state that D1-S is the BNSF Alternative and D2-N is the Bakersfield South Alternative. The second page of Volume III of the Final EIR/EIS is a general sheet with a schematic of the alignment segments that shows that B1 is the BNSF (Bakersfield North), B2 is the Bakersfield South Alternative, and B3 is the Bakersfield Hybrid Alternative. Section 2.4.4.3, Bakersfield Station Alternatives, of the Final EIR/EIS also calls out each station alternative relative to its alignment alternative.

### L005-31

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-25.

### L005-32

The required analysis related to the proposed station locations is provided in Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures, of the Final EIR/EIS in each respective resource section. Chapter 2, Alternatives, of the Final EIR/EIS provides the description of the project, not a discussion of environmental impacts.

### L005-33

The potential impacts of the project on traffic, transit, and parking demand are discussed in Section 3.2, Transportation, of the Final EIR/EIS. The potential impact on air quality of induced traffic accessing the stations is found in Section 3.3, Air Quality and Global Climate Change. Both sections cover in detail the maximum potential impacts from HST operations at the Bakersfield Station site alternatives.

### L005-33

Express trains will not induce any additional demand for parking or transit facilities.

The statement that the percentage of transit passengers arriving/departing transit stations by car and parking decreases as land use development and population around the stations increase is supported by the station access mode share at transit systems in California and across the country.

A sample of the research that supports this statement includes:

- Robert Cervero, *Rail Access Modes and Catchment Areas for the BART System* (Berkeley, CA: University of California, Berkeley, Institute of Urban and Regional Development, 1995), <http://www.escholarship.org/uc/item/0m92j0kr> (accessed May 2013) (Cervero 1995).
- Chris Hale, *Station Access and the Modern Transit System* (Adelaide, Australia: Australasian Transport Research Forum, 28–30 September 2011), [www.patrec.org/atrf.aspx](http://www.patrec.org/atrf.aspx) (accessed May 2013) (Hale 2011).
- Hollie M. Lund, Robert Cervero, and Richard W. Willson, *Travel Characteristics of Transit-Oriented Development in California* (January 2004), [http://www.bart.gov/docs/planning/travel\\_of\\_tod.pdf](http://www.bart.gov/docs/planning/travel_of_tod.pdf) (accessed May 2013) (Lund et al. 2004).
- John E. (Jay) Evans IV and Richard A. Pratt, *Transit Oriented Development: Traveler Response to Transportation System Changes*, Chapter 17, TCRP REPORT 95 (Washington, DC: Transportation Research Board, 2007), [http://www.fta.dot.gov/documents/Transit\\_Oriented\\_Development\\_-\\_Traveler\\_Response\\_to\\_Transportation\\_System\\_Changes\\_TCRP\\_Report\\_95.pdf](http://www.fta.dot.gov/documents/Transit_Oriented_Development_-_Traveler_Response_to_Transportation_System_Changes_TCRP_Report_95.pdf) (accessed May 2013) (Evans and Pratt 2007).
- Herbert S. Levinson, Paul Ryus, Joseph L. Schofer, Conor Semler, Jamie Parks, Kathryn Coffel, David Sampson, and Carol Kachadoorian, *Guidelines for Providing Access to Public Transportation Stations*, TCRP Report 153 (Washington, DC: The National Academies Press, 2012),

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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[http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_153.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_153.pdf) (accessed May 2013)  
(Levinson et al. 2012).

- Center for Neighborhood Technology, *Paved Over: Surface Parking Lots or Opportunities for Tax-Generating, Sustainable Development?* (Center for Neighborhood Technology, November 2006),  
<http://www.cnt.org/repository/PavedOver-Final.pdf> (accessed May 2013) (Center for Neighborhood Technology 2006).
- American Public Transportation Association (APTA), *Defining Transit Areas of Influence*, APTA Standards Development Urban Design Working Group, APTA SUDS-UD-RP-001-09 (Washington, DC: APTA, December 31, 2009),  
[http://www.aptastandards.com/Portals/0/SUDS/SUDSPublished/APTA%20SUDS-UD-009-01\\_areas\\_of\\_infl.pdf](http://www.aptastandards.com/Portals/0/SUDS/SUDSPublished/APTA%20SUDS-UD-009-01_areas_of_infl.pdf) (accessed May 2013) (APTA 2009).
- Union of International Railways, *High Speed and the City* (Union of International Railways, 2010), [http://www.uic.org/IMG/pdf/20101117\\_highspeed\\_thecity\\_finalreport.pdf](http://www.uic.org/IMG/pdf/20101117_highspeed_thecity_finalreport.pdf) (accessed May 2013) (Union of International Railways 2010).

### L005-34

The 90-second dwell time is incorrect. The dwell time for intermediate stations such as Bakersfield would be a minimum of 2 minutes. The dwell time for terminal stations in San Francisco, Sacramento, Merced, Los Angeles, Anaheim, and San Diego would be 30 to 40 minutes.

### L005-35

The environmental impacts associated with the No Project Alternative projected to 2035 are provided for each environmental discipline in Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures, of the Final EIR/EIS. The determination of the environmentally superior alternative is provided in the Final EIR/EIS.

### L005-36

Refer to Standard Response FB-Response-GENERAL-25.

The basis for the quoted statement in Section 2.7, Additional High-Speed Train Development Considerations, of the Final EIR/EIS is found in the text of Assembly Bill No. 3034 (2008, Galgiani), which established Prop 1A and the programmatic documents on which the project-level EIR/EIS is based. As quoted in Section 2.7, Assembly Bill No. 3034 directly addresses the issues of urban sprawl and station placement in several provisions.

“SEC. 8. (a) The continuing growth in California’s population and the resulting increase in traffic congestion, air pollution, greenhouse gas emissions, and the continuation of urban sprawl make it imperative that the state proceed quickly to construct a state-of-the-art high-speed passenger train system to serve major metropolitan areas.

(b) The High-Speed Rail Authority, after extensive studies and analysis, proposes the construction of a high-speed train system that serves major population centers in the state and that links regional and local transit systems to form an integrated transportation system throughout the state. The system will link all of the state’s major population centers, including Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego.

...

(i) The high-speed train system shall be planned and constructed in a manner that minimizes urban sprawl and impacts on the natural environment.

...

“(h) Stations shall be located in areas with good access to local mass transit or other modes of transportation.”

Also, the legislation specifically calls for the system to be “consistent with the authority’s certified environmental impact reports of November 2005 and July 9, 2008.” These programmatic documents upon which the project-level EIR/EIS is based both contain chapters on station area development with specific policies on station locations (Authority and FRA 2005, Chapter 6B, “HST Station Area Development”; Authority and FRA [2008] [2010] 2012, Chapter 6, “HST Station Area Development”). Chapter 6B states, “Select station locations that are multi-modal transportation hubs with a

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-36

preference for traditional city centers.”

The first provision of Article 2 not only calls for consistency with the program level EIR/S documents but also specifies specific station locations.

“Article 2. High-Speed Passenger Train Financing Program 2704.04. (a) It is the intent of the Legislature by enacting this chapter and of the people of California by approving the bond measure pursuant to this chapter to initiate the construction of a high-speed train system that connects the San Francisco Transbay Terminal to Los Angeles Union Station and Anaheim, and links the state’s major population centers, including Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego consistent with the authority’s certified environmental impact reports of November 2005 and July 9, 2008.”

The legislature provided an indication of the intent of its language on station locations by directly specifying the location of the San Francisco and Los Angeles stations and by banning a potential Los Banos station. For two of the most important stations in HST System, the legislature specified that the stations be located at the San Francisco Transbay Terminal and the Los Angeles Union Station multi-modal, transit hubs within walking distance of two of the most important downtown commercial centers in the state. Likewise, the legislation bans the construction of a rural or exurban station in the Los Banos area. “(d) The total number of stations to be served by high-speed trains for all of the corridors described in subdivision (b) of Section 2704.04 shall not exceed 24. There shall be no station between the Gilroy station and the Merced station.” All of the above provisions provide a clear indication that the intent of the legislature was to endorse and strengthen the station area development policies of the Authority.

The full text of Prop 1A, including all the provisions quoted above, was available to voters in the Secretary of State’s Official Voter Information Guide for November 2008. Also, both the “Argument in Favor of Proposition 1A” and the “Rebuttal to Argument Against Proposition 1A” in the Guide both mentioned downtown stations as a selling point for the system:

- “Routes linking downtown stations in SAN DIEGO, LOS ANGELES, FRESNO, SAN JOSE, SAN FRANCISCO, and SACRAMENTO, with stops in communities in

### L005-36

between.” (Capitalization in original.)

- “Travel intercity downtown to downtown throughout California on High-Speed Trains faster than automobile or air—AT A CHEAPER COST!” (Capitalization in original.)

Therefore, voters were informed of the intent of the system to serve downtown stations.

Transit, walking, and bicycling, and multi-modal travel make up nearly half of all station access trips and the vast majority of station egress trips for intercity rail service across the United States (source 1). Likewise, high levels of connecting transit service and destinations within walking distance are important to high-speed rail stations across the world (source 2). Research on foreign high-speed rail systems has shown that station location in dense urban centers, near multi-modal transportation hubs and within walking distance of large concentrations of destinations, is important for both station access and egress and for economic development purposes. Those medium sized cities that have a station in or near their center are far more able to attract development than those cities with stations far outside of their existing urban centers (source 3).

1. Bureau of Transportation Statistics, *Long Distance Mode Choice* (Washington, DC: U.S. Department of Transportation, 2006), [http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/america\\_on\\_the\\_go/long\\_distance\\_transportation\\_patterns/html/entire.html](http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/america_on_the_go/long_distance_transportation_patterns/html/entire.html) (accessed May 2013).
2. Union of International Railways, *High Speed and the City* (Union of International Railways, 2010), [http://www.uic.org/IMG/pdf/20101117\\_highspeed\\_thecity\\_finalreport.pdf](http://www.uic.org/IMG/pdf/20101117_highspeed_thecity_finalreport.pdf) (accessed May 2013).
3. Valerie Facchinetti-Mannone, *Location of High Speed Rail Stations in French Medium-Size Cities and Their Mobility and Territorial Implications* (University of Burgundy, no date), [http://hal.archives-ouvertes.fr/docs/00/76/72/26/PDF/32\\_Facchinetti\\_Mannone\\_Valerie.pdf](http://hal.archives-ouvertes.fr/docs/00/76/72/26/PDF/32_Facchinetti_Mannone_Valerie.pdf) (accessed May 2013).

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the city of Bakersfield. Section 2.4.4.3, Bakersfield Station Alternatives, of the Final EIR/EIS also calls out each station alternative relative to its alignment alternative.

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### L005-37

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-25.

The procedural requirements for the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) were followed during the environmental review for the Fresno to Bakersfield Section of the HST System.

As described in Section 1.5, Tiering of Program EIR/EIS Documents, of the Final EIR/EIS, in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA 2005), the Authority and FRA selected the BNSF Railway (BNSF) route as the Preferred Alternative for the HST System between Fresno and Bakersfield. Therefore, the project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF corridor.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF corridor.

The station locations are designed primarily to tie into the existing transportation network. City centers are where existing transit facilities are, and city centers typically have good connections to the existing highway system. The Authority has not ignored the City of Bakersfield's concerns and suggestions. Input from the City of Bakersfield has been taken into consideration in project planning since the project was initiated. The Bakersfield Station was located in Downtown Bakersfield adjacent to the Amtrak station at the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments. The Revised DEIR/Supplemental DEIS was modified to include information provided by the City of Bakersfield.

### L005-38

Refer to Standard Response FB-Response-GENERAL-02.

The procedural requirements for the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) were followed during the environmental review for the Fresno to Bakersfield Section of the HST System.

As described in Section 1.5, Tiering of Program EIR/EIS Documents, of the Final EIR/EIS, in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA 2005), the Authority and FRA selected the BNSF Railway (BNSF) route as the Preferred Alternative for the HST System between Fresno and Bakersfield. Therefore, the project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF corridor.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF corridor.

The station locations are designed primarily to tie into the existing transportation network. City centers are where existing transit facilities are, and city centers typically have good connections to the existing highway system. The Authority has not ignored the City of Bakersfield's concerns and suggestions. Input from the City of Bakersfield has been taken into consideration in project planning since the project was initiated. The Bakersfield Station was located in Downtown Bakersfield adjacent to the Amtrak station at the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments. The Revised DEIR/Supplemental DEIS was modified to include information provided by the City of Bakersfield.

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-39**

Refer to Standard Response FB-Response-GENERAL-17, FB-Response-GENERAL-19, FB-Response-GENERAL-20.

As indicated in Section 15093 of the California Environmental Quality Act (CEQA) Guidelines, a statement of overriding consideration must be prepared by the lead agency if it approves a project where the Final EIR identifies significant unavoidable adverse impacts.

### **L005-40**

Refer to Section 2.2.4, Station Alternatives, of the Final EIR/EIS for details on planning and design assumption for the stations. Within the section, Table 2-13 summarizes the planning and design assumptions for the stations throughout the implementation of the HST System in phases, and reflects forecast ridership under the “high” scenario (ticket price at 50% of airfare), which would continue to increase from 2025 to 2035.

### **L005-41**

As noted in this comment, the Authority has consulted with the City of Bakersfield regarding the Centennial Corridor Loop project. This project has been in the planning stages for many decades and, the draft environmental document is in preparation as of Spring 2014. Based on a review of Centennial Corridor Stage 2 impacts, the Fresno to Bakersfield HST project and the Centennial Corridor project can be designed to not preclude each other from construction. The design of all of the HST alternatives in Bakersfield has been progressed to minimize conflicts and impacts to Alternative B of the Centennial Corridor, (as well as the constructed Westside Parkway). It is recognized that portions of the Westside Parkway/Centennial Corridor will be temporally affected during the HST foundation and bent construction. The Authority will continue to consult with the California Department of Transportation (Caltrans) on various aspects of the HST project, as each project advances in development.

### **L005-42**

The construction of the Westside Parkway is now substantially complete. The Fresno to Bakersfield HST project Alignments B2 (Bakersfield South) and B3 (Bakersfield Hybrid)

### **L005-42**

would require the relocation of the existing off-ramp to Brimhall Ave/Coffee Rd to the north. It is recognized that traffic and operations of portions of the Westside Parkway/Centennial Corridor will be temporally affected during the HST foundation and straddle bent construction. All alternatives would require temporary traffic detours or short-term closures to install foundations outside the travel way, straddle bent support across the Westside Parkway, and steel trusses over Truxtun Avenue.

The Authority and the selected design-builder will prepare a detailed Construction Transportation Plan (CTP) to minimize the impact of construction and construction traffic on existing facilities and nearby roadways. The CTP will be prepared in close consultation with the City of Bakersfield, Kern County, and Caltrans, and the Authority will review and approve the CTP before commencing any construction activities. This plan will address, in detail, the activities to be carried out in each construction phase, with the requirement of maintaining traffic flow during peak travel periods. Such activities include, but are not limited to, the routing and scheduling of materials deliveries, materials staging and storage areas, construction employee arrival and departure schedules, employee parking locations, and temporary road closures, if any. The plan will provide traffic controls pursuant to the California Manual on Uniform Traffic Control Devices sections on temporary traffic controls (Caltrans 2012c).

### **L005-43**

The Final EIR/EIS refers to the Golden Empire Transit District as a separate agency.

### **L005-44**

Refer to Standard Response FB-Response-TR-03.

Refer to Section 2.2.4 Station Alternative of the Final EIR/EIS for details on planning and design assumption for the Stations. There are four existing parking lots located in the vicinity of the proposed station area currently available for long term parking. All four parking lots are located approximately 0.5 mile, or less, from the proposed station locations. The rationale for how parking would be met by the system is discussed in Section 2.0 Alternatives. The relatively lower number of spaces in Bakersfield is because of a higher availability of nearby parking, as opposed to the other stations. As described in this section for Bakersfield parking, the balance of the supply necessary to

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-44**

accommodate the full 2035 parking demand (8,100 total spaces) would be provided through use of underutilized facilities around the station and in Downtown Bakersfield. Identification of these additional spaces would be coordinated with the City of Bakersfield as a part of a comprehensive parking strategy. Additional environmental review may be necessary as parking needs are identified for full system operations.

### **L005-45**

Tables 3.2-28 through 3.2-31 list the differences between the project and no project for roadway segments. The tables list volume to capacity (v/c) ratios, but not volumes or average daily traffic. The differences between the v/c ratios between road segments are minor or no difference at all, indicating the capacity of the roadway segments is not measurably affected by the project. Intersections are more typically constrained or congested than roadway segments, and the tables listing the delays for Bakersfield intersections in the study area (Tables 3.2-32 through 3.2-35) show more differences in impacts between no project and project conditions. The greatest differences are generally nearest the stations.

In regards to the Bakersfield station area traffic, Q street was not assumed to be used because it is a one-lane directional street, and 23rd was not assumed to be used due to existing high travel volumes. Neither of these streets are listed in the most recent RTP for any improvements. Union Avenue was determined to be the major carrier of travel trips, as it is a more improved and divided roadway which also contains fewer signalized intersections.

### **L005-46**

The Authority has met with local agencies, including Kern County and the City of Bakersfield, and the design of the HST project does not preclude future expansion widths for cited roadways, including Santa Fe Way. In some cases, the installation of retaining walls or the steeping of existing embankment slopes may be required to meet these expansion needs. The design speeds for Renfro Road, Kratzmeyer Road and Santa Fe Way meet the requirements specified by local jurisdictions.

Additional coordination of the local roadway improvement projects through various planning and construction stages would need to be accomplished in detail between the

### **L005-46**

Authority and local agencies. The recommendations in this comment that some of the local projects be considered "early delivery projects" can be considered by the Authority and local agencies, where there is mutual responsibility and the local projects are advancing in approval and design. Similarly, funding by the Authority would be considered to the extent there is responsibility associated with the HST project to mitigate actual impacts of the project.

### **L005-47**

Refer to Standard Response FB-Response-TR-02.

Palm Avenue is proposed to be closed under the BNSF, Bakersfield South and Bakersfield Hybrid Alternatives. Verdugo Lane is proposed to be extended to connect Palm Avenue to Shellabarger Road. Please refer to Appendix 2-A Road Crossings of Section 2.0, Alternatives, for a listing of road closures. With the construction of Verdugo Lane providing access between Palm Avenue and Shellabarger Road, no impact to LOS is expected on the local road network.

As shown on pages CR1963, CR1972, and portions on CR1951, Palm Avenue will be closed by all proposed HST Alignments, and Verdugo Lane would be extended and improved to connect with Shellabarger Road. Barricades are proposed to be placed on Palm Avenue, restricting vehicle movement under the HST. The intent of the visual simulation is to demonstrate the likely view of the HST elevated guideway, and does not include the closure of Palm Avenue as it has no impact in regard to visual resources from this view point.

### **L005-48**

The Fresno to Bakersfield HST project, and the Centennial Corridor and Westside Parkway projects can be designed to not preclude either from construction. The Authority will continue to consult with Caltrans on various aspects of the HST project, as each project advances in development.

### **L005-49**

Table B-9, City of Bakersfield Projects, in Appendix 3.19-B, Planned and Potential

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### L005-49

Transportation Projects, in Volume 2 of the EIR/EIS lists the projects considered for cumulative impacts. This list was up to date at the time Section 3.19, Cumulative Impacts, was prepared and circulated with the entire Revised DEIR/Supplemental DEIS document. Appendix 3.19-B includes more than 120 roadway improvements, ranging from restriping roads to creating additional lanes and interchange and capacity expansions. This list is based on applicable plans, such as Regional Transportation Plans and Capital Improvement Programs, for the cities and counties in the study area. The list was compiled in 2010, coinciding with the creation of the traffic analysis models.

### L005-50

In the Final EIR/EIS, Figure 3.2-19 has been revised to included the proposed Centennial Corridor instead of Crosstown Freeway.

### L005-51

F Street is currently bifurcated by the BNSF/Amtrak right-of-way. F Street would be closed for one block by the BNSF Alternative.

### L005-52

Eye Street is currently bifurcated by the BNSF/Amtrak right-of-way. Eye Street would be closed for 1 block between 14th Street and the BNSF/Amtrak right-of-way by the Bakersfield Hybrid Alternative.

### L005-53

SR 178 becomes 24th Street, and divides into two one-way streets (23rd Street and 24th Street) before it turns into a freeway. The figure attached to the comment shows the exact location of these segments.

### L005-54

Refer to Standard Response FB-Response-GENERAL-01.

Impacts to important facilities that would be relocated in Bakersfield are recognized in Impact SO#6, Disruption to Community Cohesion or Division of Existing Communities

### L005-54

from Project Operation, and Mitigation Measure SO-3, Implement Measures to Reduce Impacts Associated with the Relocation of Important Facilities, in Section 3.12, Socioeconomics, Communities, and Environmental Justice, of the Final EIR/EIS. The Authority will consult with these respective parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services and to ensure relocation that allows the community currently served to continue to access these services.

### L005-55

Existing parking lots may be directly affected by the HST project, but to a limited degree. As stated in Impact TR#13, Impacts on the Local Roadway Network due to Station Activity, to minimize the potential for permanent parking loss that would affect these facilities' capacity to meet the City of Bakersfield's minimum parking requirements, the HST project would ensure that the existing parking that is removed would be replaced so that all existing parking demand will be met with off-street parking. Parking replacement would be achieved through the utilization of existing vacant lots in close vicinity to these facilities or dedicated shared use of parking spaces constructed as part of the Bakersfield Station. This effect would have negligible intensity under the National Environmental Policy Act (NEPA) and would be a less-than-significant impact under the California Environmental Quality Act (CEQA), but would require the Authority to work with the City of Bakersfield to provide suitable replacement parking or parking alternatives for the convention center and other facilities.

### L005-56

The 5-second delay criteria applies to an unsignalized intersection already functioning at LOS E or F. The Draft EIR/EIS and Revised DEIR/Supplemental DEIS included the same intersection criteria in both reports.

### L005-57

Refer to Standard Response FB-Response-TR-02.

Reina Road is proposed to be closed by the BNSF, Bakersfield South, and Bakersfield

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-57**

Hybrid Alternatives. Access would remain via Kratzmeyer Road to the north and Renfro Road to the south.

### **L005-58**

Refer to Standard Response FB-Response-TR-02.

### **L005-59**

The HST project will not preclude the City of Bakersfield or any other entity from constructing future roadway improvements and projects.

The HST project has been designed to minimize impacts on the constructed Westside Parkway and Alternative B of the future Centennial Parkway. The Authority will continue to coordinate and work with the City of Bakersfield and Caltrans to minimize additional impacts on operations and traffic during construction.

### **L005-60**

.The Rosedale Highway (SR 58) overcrossing proposd for all HST project alternatives would provide sufficient width to accomdate 6 travel lanes (3 lanes each direction) in accordance with applicable City of Bakersfield standards and required vertical clearances over railways.

### **L005-61**

.The Rosedale Highway (SR 58) overcrossing proposd for all HST project alternatives would provide sufficient width to accomdate 6 travel lanes (3 lanes each direction) in accordance with applicable City of Bakersfield standards and required vertical clearances over railways.

### **L005-62**

The Rosedale Highway (SR 58) overcrossing proposd for all HST project alternatives would provide sufficient width to accomdate 6 travel lanes (3 lanes each direction) in accordance with applicable City of Bakersfield standards and required vertical clearances over railways.

### **L005-63**

Refer to Standard Response FB-Response-TR-03.

The road closure of Eye Street would occur on the segment south of the BNSF/Amtrak rights-of-way; however, the City Hall South parking lot would maintain access from Chester Avenue. The Bakersfield Hybrid Alternative would be located on an aerial structure and has the potential to remove parking spaces where piers are located. To minimize the potential for permanent parking loss affecting these facilities' ability to meet the city of Bakersfield's minimum parking requirements, the HST would ensure that existing parking that is removed will be replaced. Parking replacement will be achieved through the utilization of existing vacant lots within the close vicinity of these facilities or dedicated shared use of parking spaces constructed as part of the Bakersfield station.

### **L005-64**

Refer to Standard Response FB-Response-GENERAL-08.

Coordination with public agencies will continue through the design and procurement process.

### **L005-65**

Refer to Standard Response FB-Response-GENERAL-08.

The HST railway overpasses are designed to applicable City of Bakersfield or Kern County design speeds; Kratzmeyer Road 55mph, Rosedale Highway 55 mph, and Renfro Road 65 mph.

Coordination with public agencies will continue through the design and procurement process.

### **L005-66**

Refer to Standard Response FB-Response-GENERAL-08.

Santa Fe Way has been designed to allow for future expansion. The reconstructed

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-66

roadway will be the required distance away for High Speed Rail and will allow for future expansion to the west (roadway overcrossing structures have been designed to accommodate the future expansion of Santa Fe Way). Horizontal and vertical geometry meet City arterial standards.

Coordination with public agencies will continue through the design and procurement process.

### L005-67

Refer to Appendix C, Future Assumed Improvements, of the Fresno to Bakersfield Section: Transportation Analysis Technical Report (Authority and FRA 2012n).

### L005-68

The Authority will replace roadway infrastructure impacted by the project to the same level of service that exists at the time of project construction. Roadway overcrossings and other HST structures will be built to provide room for the ultimate buildout of roadways planned by local jurisdictions. Coordination with public agencies will continue through the design and procurement process.

### L005-69

Refer to Standard Response FB-Response-PU&E-02, FB-Response-AQ-04.

Section 3.3 of the EIR/EIS identifies construction-related emissions as a significant impact. Those mitigation measures would be reduced to a level of less than significant by reduction in on-road and off-road construction equipment emissions, control of fugitive dust emissions, and emission offsets through participation in the VERA program and purchase of emission offsets. None of the comments provided in this submission provide substantial evidence that proposed mitigation would not reduce construction emissions to a level less than significant.

Emissions were quantified for traffic generated by the Bakersfield station, including station employees. In response to this comment, emissions were also quantified for deliveries to the station. These emissions were used to calculate ground level

### L005-69

concentrations of criteria pollutants associated with the project and health risks to nearby sensitive receptors. As stated in the Final EIR/EIS, these emissions would not result in a significant impact.

Section 3.6, Public Utilities and Energy, estimates the proposed project's electricity demand. The electrical requirements of the HST system are discussed on page 3.6-43. No new electrical generation units would be required due to the proposed project.

The Revised DEIR/Supplemental DEIS, Section 3.6, Public Utilities and Energy (Table 3.6-18), provides information about the multistate electrical grid serving California and supplying the HST system energy demand. The HST project would set a priority on the use of renewable energy sources and not require the construction of a separate power source, although it would include the addition and upgrade of power lines to a series of substations positioned along the HST corridor.

The Authority's policy goal is to use 100% clean, renewable electricity for the operation of the HST. This goal can be achieved through purchase agreements with power suppliers, and through the design of project buildings and facilities to meet Leadership in Energy and Environmental Design (LEED) Silver Level certification. California utilities are required to achieve a state-mandated 33% renewable portfolio within the time frame of projected operation of the HST. This will offer new opportunities for obtaining clean, renewable energy from those sources.

Also, refer to the summary of electricity requirements in Section 2.2.6, Traction Power Distribution; Section 3.6.5.C, High-Speed Train Alternatives, regarding how the energy demand would be met.

Modeling was redone using Bakersfield meteorological data. The results of that modeling are provided in the Final EIR/EIS. Using the Bakersfield meteorological data, project operations would not result in significant impacts.

As described in Section 3.3 of the EIR/EIS, construction of the HST alignment (specifically, onsite off-road construction exhaust emissions) would be subject to an Indirect Source Review (ISR) under Rule 9510. Accordingly, the Authority would have to

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-69

submit an Air Impact Assessment (AIA) application to the SJVAPCD with commitments to reduce construction exhaust NOx and PM10 emissions by 20% and 45%, respectively. According to SJVAPCD, if successful, AQ-MM #1 (use of cleaner-burning construction equipment) might, as a practical matter, satisfy these numerical reduction requirements; if not, AQ-MM #4 would satisfy the ISR requirements. Operation of the HST would be exempt under Sections 4.1 and 4.2 of Rule 9510.

Project construction can occur for 6 hours a day during weekdays and 12 hours/day during weekends in the vicinity of schools during the normal school year and not conflict with Bakersfield's Noise Ordinance. During summer recess, construction can take place for 12 hours/day throughout the week and not interfere with the Noise Ordinance. In addition, mitigation measure N&V-MM#1 lists an array of noise mitigation measures that can be implemented by the construction contractor to reduce construction noise impacts during nighttime hours.

### L005-70

Refer to Standard Response FB-Response-HMW-01, FB-Response-PU&E-02.

The analysis conducted in the Final EIR/EIS did not specifically identify individual sensitive receivers for the construction analysis. Instead, as a generalized classification, sensitive receivers (such as schools, residences, day care centers, and health care facilities) were analyzed to determine appropriate distances from the construction operations that would result in less-than-significant impacts with respect to health risks. Since the time period that the guideway/alignment would pass any specific sensitive receiver would be less than 1 year, the level of exposure is not expected to increase the cancer risk of 10 in a million to sensitive receivers.

Section 5.6 of the Air Quality Technical Report has been revised to explain the methodology used to identify sensitive receivers (Authority and FRA 2012). Sensitive receivers were identified using the Geographic Names Information System (GNIS) to identify both schools and hospitals (USGS 2011). Residences were identified using parcel and zoning information. Sections of the HST track that did not have any sensitive receivers other than residences are not shown, but the whole section of track was analyzed to identify sensitive receivers within 1,000 feet of the track.

### L005-70

Section 3.6, Public Utilities and Energy, estimates the proposed project's electricity demand. No new electrical generation units would be required due to the proposed project. The Authority's policy goal is to use 100% clean, renewable electricity for the operation of the HST.

Furthermore, the Authority has entered into a memorandum of understanding with FRA, EPA, and the U.S. Department of Energy to support common sustainability goals. These include minimizing air and water pollution, energy usage, and other environmental impacts. This memorandum of understanding can be found on the Authority's website. The signatory agencies recognize that construction and operation of the HST system would require a large amount of energy and that ample opportunities exist to promote energy efficiency and renewable energy.

### L005-71

The Revised DEIR/Supplemental DEIS was revised to include information about the future Corporate Average Fuel Economy (CAFE) standards, adopted on May 7, 2010, which would require substantial improvements in fuel economy for all vehicles. Information about the updated federal fuel economy standards can be found in Section 3.3.4.2, Statewide and Regional Emission Calculations, of the Final EIR/EIS.

In January of 2012, the California Air Resources Board (CARB) approved a vehicle emission control program for model years 2017 through 2025. This program is called the Advanced Clean Cars Program. On August 28, 2012, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) issued a joint Final rulemaking to establish 2017 through 2025 greenhouse gas (GHG) emissions and CAFE standards. To further California's support of the national program to regulate emissions, CARB submitted a proposal that would allow automobile manufacturer compliance with EPA's requirements to show compliance with California's requirements for the same model years. The Final Rulemaking Package was filed on December 6, 2012, and the final determination is expected by January 18, 2013.

The impact of these recent regulations on vehicles in the future and the comparison to the no build alternative would be that the percentage reduction in emissions between the

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-71**

project and no build alternative would remain the same and result in a net reduction in carbon dioxide (CO<sub>2</sub>) emissions because the activity remains the same and the same emission factors are used for each scenario. The absolute value of the emissions will show a decrease due to the decrease in emission factors.

### **L005-72**

Refer to Standard Response FB-Response-PU&E-02.

Section 3.6, Public Utilities and Energy, estimates the proposed project's electricity demand. The electrical requirements of the HST are discussed on page 3.6-43. No new electrical generation units would be required because of the proposed project. The Authority's policy goal is to use 100% clean, renewable electricity for the operation of the HST. This goal can be achieved through purchase agreements with power suppliers, and through the design of project buildings and facilities to meet Leadership in Energy and Environmental Design (LEED) Silver Level certification. California utilities are required to achieve a state-mandated 33% renewable portfolio within the time frame of the projected operation of the HST. This will offer new opportunities for obtaining clean, renewable energy from those sources. Furthermore, the Authority has entered into a memorandum of understanding with FRA, EPA, and the U.S. Department of Energy to support common sustainability goals. These include minimizing air and water pollution, energy usage, and other environmental impacts. This memorandum of understanding can be found on the Authority's website at. The signatory agencies recognize that construction and operation of the HST system would require a large amount of energy and that ample opportunities exist to promote energy efficiency and renewable energy.

### **L005-73**

Refer to Standard Response FB-Response-PU&E-02.

Section 3.6, Public Utilities and Energy, estimates the proposed project's electricity demand. The electrical requirements of the HST are discussed on page 3.6-43. No new electrical generation units would be required because of the proposed project. The Authority's policy goal is to use 100% clean, renewable electricity for the operation of the HST. This goal can be achieved through purchase agreements with power suppliers and through the design of project buildings and facilities to meet Leadership in Energy and

### **L005-73**

Environmental Design (LEED) Silver Level certification. California utilities are required to achieve a state-mandated 33% renewable portfolio within the time frame of projected operation of the HST. This will offer new opportunities for obtaining clean, renewable energy from those sources. Furthermore, the Authority has entered into a memorandum of understanding with FRA, EPA, and the U.S. Department of Energy to support common sustainability goals. These include minimizing air and water pollution, energy usage, and other environmental impacts. This memorandum of understanding can be found on the Authority's website. The signatory agencies recognize that construction and operation of the HST system would require a large amount of energy and that ample opportunities exist to promote energy efficiency and renewable energy.

### **L005-74**

Refer to Standard Response FB-Response-PU&E-01, FB-Response-PU&E-02.

The project team has been coordinating, and will continue to actively coordinate, with Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) during the early design phases of the project to identify, describe, and evaluate the HST's potential impact on existing electrical and gas infrastructure. As appropriate and commensurate to the early stage of engineering design, modifications have been made to the Revised DEIR/Supplemental DEIS to reflect the comments provided (refer to Section 3.6.2 Laws, Regulations, and Orders).

Where the project would require modification of any electrical substation or electrical transmission, power, or distribution line, such modifications would be conducted in compliance with the California Public Utilities Commission's General Order 131-D. The Authority will assist utility providers in applying for a permit from the CPUC under CPUC General Order 131-D, including the need for any additional environmental review necessary for transmission line relocation or extension, or other new or modified facilities, and any localized increase in electrical loads identified as part of the more detailed design.

No new electrical generation units would be required due to the proposed project.

Refer to Section 3.6, Public Utilities and Energy, for an estimate of the proposed

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-74**

project's electricity demand. Page 3.6-43 of the Revised DEIR/Supplemental DEIS discusses the electrical requirements of the HST.

### **L005-75**

Refer to Standard Response FB-Response-PU&E-01, FB-Response-PU&E-02.

The project team has been coordinating, and will continue to actively coordinate, with Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) during the early design phases of the project to identify, describe, and evaluate the HST's potential impact on existing electrical and gas infrastructure. As appropriate and commensurate to the early stage of engineering design, modifications have been made to the Revised DEIR/Supplemental DEIS to reflect the comments provided (refer to Section 3.6.2 Laws, Regulations, and Orders).

Where the project would require modification of any electrical substation or electrical transmission, power, or distribution line, such modifications would be conducted in compliance with the California Public Utilities Commission's General Order 131-D.

No new electrical generation units would be required due to the proposed project.

Refer to Section 3.6, Public Utilities and Energy, for an estimate of the proposed project's electricity demand. Page 3.6-43 of the Revised DEIR/Supplemental DEIS discusses the electrical requirements of the HST.

### **L005-76**

Concentrations of particulate matter smaller than or equal to 2.5 microns in diameter (PM<sub>2.5</sub>) and particulate matter smaller than or equal to 10 microns in diameter (PM<sub>10</sub>) resulting from construction emissions have been modeled. The results of this analysis are provided in the Final EIR/EIS. The analysis found that the project would not result in a significant air quality impact.

### **L005-77**

The demolition of asbestos-containing materials is subject to the limitations of the

### **L005-77**

National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations and require an asbestos inspection. The San Joaquin Valley Air Pollution Control District's Compliance Division will be consulted before demolition begins. The project will include strict compliance with existing asbestos regulations as part of the project design. Demolition plans will be prepared for the safe dismantling and removal of building components and debris. The demolition plans will include a plan for lead and asbestos abatement. State and federal regulations typically require preparation of, and compliance with, asbestos-containing material abatement plans before disturbing asbestos-containing materials. These abatement plans ensure that the public is not exposed to asbestos.

### **L005-78**

Refer to Standard Response FB-Response-PU&E-02.

Section 3.6, Public Utilities and Energy, page 3.6-71, states that the energy consumption estimate for constructing the Fresno to Bakersfield Section is 7,010.2 billion British thermal unit (Btu) for the BNSF Alternative. Construction of the various other alternatives would range from approximately 713.7 billion Btu (10.2%) less than the BNSF Alternative, to 289.2 billion Btu (4.2%) greater than the BNSF Alternative.

The Authority's policy goal is to use 100% clean, renewable electricity for the operation of the HST. This goal can be achieved through purchase agreements with power suppliers and through the design of project buildings and facilities to meet Leadership in Energy and Environmental Design (LEED) Silver Level certification. California utilities are required to achieve a state-mandated 33% renewable portfolio within the time frame of the projected operation of the HST. This will offer new opportunities for obtaining clean, renewable energy from those sources. Furthermore, the Authority has entered into a memorandum of understanding with FRA, EPA, and the U.S. Department of Energy to support common sustainability goals. These include minimizing air and water pollution, energy usage, and other environmental impacts. It is unclear what greenhouse gas emissions would be generated that could be analyzed from the HST use of renewable energy sources, such as those derived from direct solar radiation or wind. Renewable energy sources generally do not emit greenhouse gases.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-78**

This memorandum of understanding can be found on the Authority's website. The signatory agencies recognize that construction and operation of the HST system would require a large amount of energy and that ample opportunities exist to promote energy efficiency and renewable energy.

### **L005-79**

The Authority well understood the problems with using the URBEMIS model to estimate construction emissions, that is, the load factor double-counting issue. In April 2012 before calculating emissions, the Deputy Attorney General contacted the San Joaquin Valley Air Pollution Control District (SJVAPCD) and the California Air Resources Board (ARB) by email regarding the following methodological items: " (1) EMFAC 2007 vs. EMFAC 2011. We understand that EMFAC 2011 is not yet EPA-approved for GC determinations. In light of that, HSRA intends to use EMFAC 2007 for the revised DEIR/S and GC quantitative analysis (we will mention EMFAC 2011 and discuss qualitatively the differences that would obtain if it were used, but will not include a second set of numbers). Please advise if ARB or SJVAPCD disagree."

"(2) No use of any construction emissions model. Because of the under-reporting issues inherent with URBEMIS (i.e., the load factor double-counting problem), and the lack of any model that is well-suited to a long linear project, the revised DEIR/S and GC quantitative analysis will not use any model. Instead, the calculations will be done via spreadsheet that discloses all inputs and assumptions. Please advise if ARB or SJVAPCD disagree. This is the approach taken in Merced-Fresno to validate the URBEMIS results, as HSRA has discussed extensively with SJVAPCD based on SJVAPCD's terrific technical input."

The Attorney General received confirmation in personal communications with Dan Barber at SJVAPCD and Kurt Karperos at the California ARB that U.S. Environmental Protection Agency (EPA) wanted the Authority to use the EMFAC 2007 for modeling on-road vehicles for the conformity analysis and SJVAPCD deferred to the EPA for this issue. Both agencies agreed that input and assumption spreadsheets were the best approach for estimating construction emissions. Because both trustee agencies approved the proposed methodology for calculating impacts before the emissions were

### **L005-79**

modeled, the models used to evaluate the impacts were sufficient to disclose construction and operations emissions of the proposed project.

### **L005-80**

Additional information on localized air quality impacts involving construction emissions of criteria pollutants and air toxics is provided in Section 3.3.6, Environmental Consequences, of the Final EIR/EIS. This information indicates that project construction would not result in significant local air quality impacts. Greenhouse gas (GHG) emissions do not have local impacts, because carbon dioxide is not an air pollutant impacting human health. GHG emissions are a global issue; this issue is addressed as such in the EIR/EIS.

### **L005-81**

This comment implies that the project should not go forward because it would use mitigation credits others could use. The point of the program is to reduce air pollutant emissions, not who should have the opportunity to use the program. To forgo one project in order to "save" credits for other projects to use in the future is not the purpose of the program and not relevant to this environmental analysis.

With regard to the project's impact on achieving air quality compliance in the San Joaquin Valley, please see the conformity analysis provided in Section 3.3 of the Final EIR/EIS.

### **L005-82**

The health risk assessment for project construction in Bakersfield has been redone using Bakersfield meteorological data and is reported in Section 3.3.6 of the Final EIR/EIS. The results of the analysis indicate that project construction would not result in a significant health risk.

### **L005-83**

The analysis in chapter 3.3 identifies that modeling analysis was conducted for the HMF emissions to evaluate impacts on air quality, including a health risk analysis. The Authority and FRA are considering multiple locations for locating the single HMF site

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### L005-83

needed for the statewide HST system and a final site will not be selected until some point in the future, after completion of the Fresno to Bakersfield EIR/EIS process. The air quality analysis was conducted for a prototypical facility. Once a preferred location and design are chosen, a detailed analysis will be conducted. The conservative analysis identified the potential for significant impacts, but determined that implementation of mitigation measures AQ-MM#6 and AQ-MM#7 would reduce the risk to less than applicable thresholds.

### L005-84

Emissions related to the delivery of goods and services and the indirect increase in emissions from the city wastewater treatment plant have been included in the health risk assessment provided in Section 3.3.6 of the Final EIR/EIS. The results of the analysis indicate that project operation will not have a significant impact on health risk.

### L005-85

Refer to Standard Response FB-Response-AQ-01.

Although Valley Fever fungi are commonly found in the soil in the Central Valley and can be stirred into the air by anything that disrupts the soil, the potential for the operational HST to generate dust through induced air flow is low. Therefore, the impacts from Valley Fever during operations will be less than significant. In addition, the dust minimization measures listed in Section 3.3.8 of the Revised DEIR/Supplemental DEIS would further reduce fugitive dust emissions to a less-than-significant impact. Valley Fever spores would be released when the soil is disturbed; however, due to the minimization measures, fugitive dust disturbance during construction will be minimal. Therefore, impacts from Valley Fever spores will be less than significant.

### L005-86

Refer to Standard Response FB-Response-HMW-01, FB-Response-PU&E-02.

The analysis conducted in the Final EIR/EIS did not specifically identify individual sensitive receptors for the construction analysis. Instead sensitive receptors (such as schools, residences, day cares, and health care facilities) as a generalized classification

### L005-86

were analyzed to determine appropriate distances from the construction operations that would be appropriate to result in less-than-significant impacts with respect to health risks. Because the guideway/alignment that runs past any specific sensitive receptor would be under construction for less than 1 year, this short period and level of exposure is not expected to increase the cancer risk chances of 10 in a million to sensitive receptors.

Demolition of buildings and other structures was evaluated as part of the construction emissions. Details of the analysis are found in Section 6.8.3.2 of the Air Quality Technical Report and Appendix A of that report. The types of emissions that could be of concern for health impacts come from asbestos material, exhaust from diesel-fueled equipment, and fugitive dust. Because the construction period is short for any particular section of the track, it was concluded that health risks associated with diesel particulate matter would be less than significant. Asbestos is controlled by compliance with existing regulations, which ensure that the public is protected when dealing with asbestos-containing material or naturally occurring asbestos. Finally, the particulate matter from fugitive dust during demolition is controlled by the project design features incorporated into the project, as detailed in Section 3.3.8 of the Final EIR/EIS. Therefore any of the anticipated sources of emissions associated with demolition are reduced to a less-than-significant level due to existing regulations, project design features, and mitigation measures.

No power generation units are proposed as part of the project. There are traction power substations and switching and paralleling stations proposed to regulate the electricity to the train, but these do not generate power or create emissions.

### L005-87

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05.

### L005-88

Refer to Standard Response FB-Response-GENERAL-02.

Typically, below-grade construction in urban areas is cost-prohibitive due to underground utility infrastructure and, in some cases, subsurface cultural resources.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-88**

While elevated structures are more costly to construct than at-grade profiles, tunnel and trench segments are more costly than both elevated and at-grade track profiles. Please refer to Chapter 5 of the EIR/EIS, Project Costs, for information and breakdown of project costs by alternative.

There are no tunnels planned for the Fresno to Bakersfield Section of the HST. No tunnels are described in Chapter 2 of the EIR/EIS.

### **L005-89**

Three types of HST technology were analyzed by the California Intercity High-Speed Rail Commission for the Statewide Program EIR/EIS. These three technologies were Steel-Wheel-on-Steel-Rail at Lower Speed (below 200 miles per hour [mph]); Magnetic Levitation Technology (maglev); and Steel-Wheel-on-Steel-Rail (very high speed [VHS]; above 200 mph). The Authority's enabling legislation, Senate Bill (SB) 1420 (chaptered September 24, 1996, Chapter 796, Statute of 1996), defines high-speed rail as "intercity passenger rail service that utilizes an alignment and technology that makes it capable of sustained speeds of 200 mph (320 kph [kilometers per hour]) or greater." Therefore, technologies in which trains travel below 200 mph were eliminated from further consideration. This direction is consistent with foreign HST experience, the experience of the northeast corridor (Boston–New York–Washington, D.C.), and HST studies done elsewhere in the United States, which show that to compete with air transportation and generate high ridership and revenue, the intercity HST travel times between the major transportation markets must be below 3 hours. From this determination, the Commission directed staff to focus technical studies on VHS (Steel-Wheel-on-Steel-Rail at Very High Speeds [above 200 mph]) and maglev technologies. Although a completely dedicated train technology using a separate track/guideway would be required on the majority of the proposed system for both technologies, requiring such separation everywhere in the system would prohibit direct HST service to certain heavily constrained terminus sections (e.g., San Francisco Peninsula from San Jose to San Francisco and the existing rail corridor between Los Angeles Union Station and Orange County). Because of extensive urban development and severely constrained right-of-way, HST service in these terminus sections would need to share physical infrastructure (tracks) with existing passenger rail services in existing or slightly modified corridors. A maglev system, in addition to being more a costly technology, requires separate and distinct guideway

### **L005-89**

configurations that preclude the sharing of rail infrastructure. As a dedicated (exclusive guideway) high-speed rail service along existing right-of-way corridors in all segments of the system would be infeasible, use of maglev technology for portions of the project would preclude direct HST service without passenger transfer and would not satisfy the travel time requirements of the project purpose and need. Other rail transportation configurations, including monorail, were eliminated from further consideration for not meeting this basic system requirement. A VHS system would be compatible with other trains sharing the tracks. The potential for utilization of shared track allows for individual project segments to meet independent utility requirements. By comparison, maglev technology does not lend itself to incremental improvements and could not satisfy independent utility requirements or meet the project's blended system approach. By taking advantage of the existing rail infrastructure, a shared-use configuration would be mostly at-grade. Shared-use options are less costly and would result in fewer environmental impacts compared with exclusive guideway options.

Also, improved regional commuter service (electrified, fully grade-separated, with additional track and security features) would help mitigate the impacts along existing rail corridors. Shared-use improvements in these corridors would potentially improve automobile traffic flow at rail crossings and reduce noise impacts, because a grade-separated system could eliminate trains blowing warning horns throughout the alignment. Shared-use options would provide the opportunity for a partnership with right-of-way owners and commuter rail operators and would provide the opportunity to incrementally improve network segments. For these reasons, maglev technology was eliminated from further investigation in the Final Program EIR/EIS (Authority and FRA 2005), is not part of the project description, and does not require further consideration in this project-level EIR/EIS.

### **L005-90**

Appendix G of the CEQA Guidelines is a model checklist to assist agencies in assessing the significance of environmental impacts. By its own terms, it is not intended to be a threshold of significance and is not a required approach. The CEQA criteria used in the Revised DEIR/Supplemental DEIS are described in Section 3.4.3.5. The Authority has exercised its judgment as lead agency to establish assessment criteria that correctly characterize the significance of the project's noise impacts. The applicable noise

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### L005-90

standards are the FRA noise standards because they directly apply to this type of project.

### L005-91

Refer to Standard Response FB-Response-N&V-03.

### L005-92

Refer to Standard Response FB-Response-N&V-03.

### L005-93

The short-term noise measurements (1-hour) were matched up with nearby long-term measurements (24-hour) that had similar types of nearby predominant noise sources. During the 1-hour short-term measurement, the nearby long-term measurement was being conducted. As the noise levels at the long-term measurement site rose and fell, we correlated this data with the short-term measurement site to see how the noise levels would rise and fall throughout the entire day in comparison with the long-term measurement data. These two noise levels were compared in order to come up with an estimated Ldn value at the short-term measurement site for the entire day based on the long-term measurement data.

### L005-94

Refer to Standard Response FB-Response-N&V-03.

The applicable noise standards are the FRA noise standards because they directly apply to this type of project.

### L005-95

The short-term noise measurements summarized in the report include the actual measured short-term equivalent sound level (in decibels A-weighted [dBA]) (Leq) values and the estimated day-night sound level (dBA) Ldn values. These values were estimated by comparing the short-term (1-hour) measured Leq values with the corresponding Leq values for the same hour at a nearby long-term measurement location. The difference between the two hourly average levels was applied to the

### L005-95

measured Ldn value of the long-term site, and this difference was used to estimate the Ldn value at the short-term site. Noise mitigation measures are called out for that portion of the project alignment.

Because noise levels can vary from day to day, the noise data presented in the EIR/EIS is validated by the noise measurement conducted by the commenter (measured within 1 dBA of the EIR/EIS data).

### L005-96

Refer to Standard Response FB-Response-N&V-03.

The Community Noise Equivalent Level (CNEL) metric is not being used as part of this project. The applicable noise standards are the FRA noise standards because they directly apply to this type of project.

### L005-97

Refer to Standard Response FB-Response-N&V-05.

As described in Section 3.12.11, mitigation measures have been identified that will minimize the impacts on businesses during construction, including signage, maintaining access as much as possible, and providing a community ombudsman. In addition, other sections of the EIR/EIS identify mitigation measures related to traffic (Section 3.2.7), dust (Section 3.3.7), and noise (Section 3.4.6).

### L005-98

Refer to Standard Response FB-Response-N&V-03, , FB-Response-N&V-02.

Noise is evaluated based on the FRA guidance manual, and the guidance manual does not specify low-frequency noise.

### L005-99

Refer to Standard Response FB-Response-PU&E-02, FB-Response-LU-04.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-99**

The RDEIR/SDEIS provides information about the multi-state electrical grid serving California and the HST System energy demand in Section 3.6 Public Utilities and Energy (Table 3.6-18). The Fresno to Bakersfield Section of the HST is estimated to require 78 megawatts (MW) of peak demand, which is within existing reserves. The HST Project would set a priority on the use of renewable energy sources and not require the construction of a separate power source, although it would include the addition and upgrade of power lines to a series of substations positioned along the HST corridor. Please refer to the summary of electricity requirements in Section 2.2.6, Traction Power Distribution, in Chapter 2, Alternatives. Section 3.6.5 C, High-speed Train Alternatives, discusses how the energy demand would be met.

The Authority's policy sets a goal to use 100% clean, renewable electricity for the operation of the High Speed Train (HST). This goal can be achieved through purchase agreements with power suppliers, and through the design of project buildings and facilities to meet Leadership in Energy and Environmental Design (LEED) Silver Level certification. California utilities are required to achieve a state-mandated 33% renewable portfolio within the time frame of projected operation of the HST. This will offer new opportunities for obtaining clean, renewable energy from those sources. Further, the Authority has entered into a Memorandum of Understanding (MOU) with FRA, EPA, and the U.S. Department of Energy to support common sustainability goals. These include minimizing air and water pollution, energy usage, and other environmental impacts. This MOU is located on the Authority's website.

CEQA Guidelines Section 15145 state that if, after thorough investigation, a Lead Agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact. The comment regarding increasing rates is highly speculative at this time and, in the CEQA/NEPA context, does not need to be analyzed in the EIR/EIS.

### **L005-100**

In Section 3.7, Biological Resources and Wetlands, of the Revised DEIR/Supplemental DEIS, the discussion of impacts on special-status plants and wildlife is organized by alternative alignment. This organization inherently provides information about where species occur because alignment alternatives (excluding the BNSF Alternative) are

### **L005-100**

associated with a particular geographic location. For example, species that occur in Bakersfield are discussed under the Bakersfield area alternatives, and species that occur in the Hanford area are discussed under the Hanford area alternatives. Additionally, Appendix 3.7-B provides a table listing the available area of suitable habitat in the alternative alignments, by species, allowing a reader to determine where impacts on a particular species could potentially occur.

### **L005-101**

Refer to Standard Response FB-Response-BIO-02, FB-Response-GENERAL-01.

The mitigation is not optional. It is committed to by the Authority and will be required in accordance with permits to be obtained from regulatory agencies. In Section 3.7, Biological Resources and Wetlands, of the Revised Draft EIR/Supplemental Draft EIS, the word "could" is used in the limited situations where options are provided for carrying out compensatory mitigation. The term "will" is used to specify that "Authority will determine compensatory mitigation" in consultation with the appropriate regulatory agency as part of the permitting process for the HST project. Therefore, the mitigation measure itself will be carried out and is not optional. However, because the details of the compensatory mitigation approach will be refined through consultation with the regulatory agencies, at this time there are options for how the mitigation will be carried out.

The Authority is committed to undertaking the mitigation measures identified. The specifics of that mitigation will be refined further through the extensive permitting processes by regulatory agencies, such as the USACE, USFWS, and the California Department of Fish and Wildlife. The project cannot proceed without these permits.

### **L005-102**

In Section 3.7.4.5 of the Revised DEIR/Supplemental DEIS, the following text was added to the description of the Metropolitan Bakersfield Habitat Conservation Plan: "The incidental take permit associated with the MBHCP will expire in August 2014; however, an application for an extension has been submitted." Section 3.7.2.4 references habitat conservation plans briefly and is not the appropriate place for that level of detailed information about the plans.

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-103**

A list of permits required for the HST project is presented in Section 2.9, Permits, of the Revised DEIR/Supplemental DEIS. Additionally, the permits required for biological resources and wetlands are discussed in more detail in Section 6 of the Fresno to Bakersfield Section: Biological Resources and Wetlands Technical Report.

Additionally, Table 3.7-1 in the Final EIR/EIS has been revised to include statements regarding what permits are required by, or already obtained from, the federal and state regulatory agencies. An example of the statements added to each applicable row in Table 3.7-1 is: "The Authority and FRA will be in compliance with EO 11990 through the Section 404 permitting process with the USACE."

### **L005-104**

Refer to Standard Response FB-Response-BIO-01.

Furthermore, because of the sensitive nature of working in jurisdictional water (the Kern River), construction will be staged outside of the riparian area (adjacent to the river) and work within the river will be minimized. Construction over the Kern River does not require fencing or other significant barriers, and as such, the construction period does not require a complete barrier to movement of wildlife along the Kern River linkage. The alternative would be constructed on an elevated guideway or viaduct, and therefore, the impacts on the Kern River linkage are minimal and wildlife will be able to move freely under the alignment. Because of the temporary nature of the construction and the small amount of natural land that would be affected, the effect determination made in the Revised DEIR/Supplemental DEIS is appropriate (negligible and less than significant).

### **L005-105**

Refer to Standard Response FB-Response-BIO-01.

In response to the commenter's recommendations that the HST project adopt additional mitigation measures in line with the mitigation measures implemented in the Westside Parkway project, only signatories to the Metropolitan Bakersfield Habitat Conservation Plan (MBHCP) can participate in the Habitat Conservation Plan. Whereas the Westside Parkway's project proponents are both signatories of the MBHCP (City of

### **L005-105**

Bakersfield and Caltrans), the Authority and FRA are not signatories. Therefore, the MBHCP does not apply to the HST project.

In response to the commenter's recommendations that the HST project adopt specific measures in line with the mitigation measures implemented with the Westside Parkway project (including restricting project and construction fencing to staging areas or areas where public safety is an issue, and installing large culverts with protective gratings at known wildlife crossings), these issues are discussed further, below.

For security purposes, the HST project must be grade-separated, and for this reason, the outer edge of at-grade sections of the HST right-of-way will be protected by an 8-foot-high security fence. However, where the HST track is elevated or includes bridge structures, the track will not require security fencing. Therefore, the commenter's recommended mitigation measure to restrict project fencing is not feasible and cannot be adopted.

Dedicated wildlife crossing structures have been proposed as part of the project description and are described in Chapter 2, Alternatives, of the Revised DEIR/Supplemental DEIS, to ensure permeability underneath the alignment for wildlife movement. These dedicated wildlife crossing structures were designed in consultation with San Joaquin kit fox expert, Dr. Brian Cypher, and are expected to facilitate wildlife movement not only for kit fox, but for other wildlife species in the region. These structures also include escape dens for kit fox as refugia against predatory species such as domestic dogs and coyotes. Therefore, the commenter's recommended mitigation measure to install large culverts with protective gratings is consistent with measures already included as part of the project description, and need not be adopted in place of the dedicated wildlife crossing structures.

Consistent with the commenter's recommendation, construction fencing will be limited to staging areas and areas where public safety is an issue. Section 2.8.1, General Approach, of the Final EIR/EIS has been revised and the following sentence has been added: "Where fencing is required, it would be restricted to areas designated for construction staging and areas where public safety is an issue."

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-106**

The Revised DEIR/Supplemental DEIS discusses the Metropolitan Bakersfield Habitat Conservation

Plan (MBHCP) in relation to the HST project under Direct Impacts During Construction Periods (Impact Bio #3) and Direct Project Impacts (Impact Bio #7) (See Section 3.7). The discussion notes that the project will be subject to similar mitigation ratios as would apply to projects subject to the MBHCP and concludes that the project would therefore not interfere or conflict with the MBHCP.

In response to the commenter's recommendations that the HST project adopt additional mitigation measures in line with mitigation measures implemented with the Westside Parkway project, only signatories of the MBHCP can participate in the Habitat Conservation Plan. Whereas the Westside Parkway's project proponents are both signatories of the MBHCP (City of Bakersfield and Caltrans), the Authority and the FRA are not signatories. Therefore, the MBHCP does not apply to the HST project. The HST project will be subject to its own mitigation requirements, pursuant to federal and state permitting requirements under Section 404 of the Clean Water Act and Section 1602 of the California Fish and Game Code. This will require the project to comply with the Federal Endangered Species Act and the California Endangered Species Act, respectively. Compensatory mitigation for impacts on upland habitats will be conducted through compensatory mitigation for impacts on special-status wildlife species habitat. Mitigation ratios presented in the Revised DEIR/Supplemental DEIS are presented as a minimum ratio for compensation. Final mitigation measure ratios for this project will be determined through consultation with the appropriate regulatory agencies, including the USFWS and California Department of Fish and Wildlife. No permits will be issued until the specific mitigation ratios are established and the Authority agrees to implement the mitigation.

In response to the commenter's recommendations that the HST project adopt specific measures in line with the mitigation measures implemented with the Westside Parkway project, including providing compensatory mitigation for sensitive species for temporary and permanent impacts for habitat loss, this approach is consistent with the mitigation measures proposed in Section 3.7.7.3, Project Mitigation Measures, of the Revised DEIR/Supplemental DEIS, recommending compensatory mitigation for permanent and

### **L005-106**

temporary habitat loss.

### **L005-107**

As stated on page 3.11-30 of the EIR/EIS: "These areas [areas with a high risk of or high impact from derailment] include elevated guideways and approaches to conventional rail and roadway crossings." The HST would be elevated through Bakersfield. Therefore, these containment features would be located along the alignment throughout Bakersfield. A site-specific hazard analysis will be performed on the entire alignment, determining the applicability and estimating the effectiveness of applying mitigation measures to the design of the location under consideration.

### **L005-108**

The inundation area for a Lake Isabella dam failure is shown on Figure 3.9-6 of the EIR/EIS. Impact GSS #1 in Section 3.9.5.3 of the EIR/EIS describes the potential impact of inundation from failure of the Lake Isabella Dam. As described in that section, it would take 6 to 8 hours for escaped water from the reservoir to reach a flooding depth of 1 foot at any of the proposed Bakersfield station sites. In the unlikely event that Lake Isabella Dam did fail, this should allow ample time to evacuate people from HST facilities and tracks.

The project would not close or block any evacuation routes identified in the plan. As stated in Section 3.11.6, the Authority would coordinate with emergency response providers as part of the Fire/Like Safety Program for the project. This would include coordination with the Kern County Office of Emergency Services to update the plan to include the HST, as appropriate, in accordance with Chapter 6 of the Dam Failure Evacuation Plan.

### **L005-109**

The HST would be elevated 50 to 90 feet on a viaduct through Bakersfield. The public would be excluded from accessing the viaduct by fencing that would be monitored electronically and visually. Maintenance trains would inspect the tracks regularly during non-operating hours. The Department of Homeland Security will have responsibility for developing anti-terrorist measures for the HST system. These facts, combined with the

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-109

lack of terrorist activity in Kern County, has led the Authority to judge that the possibility of terrorist activities involving the HST in the city of Bakersfield is remote.

### L005-110

It is not possible to provide a mathematical probability/risk calculation for an accident on the California HST System that would result in injury to people adjacent to the right-of-way. Such a calculation requires multiyear information on passenger miles traveled and number of accidents that result in offsite injuries and/or fatalities. There are no HST systems operating in the United States. Therefore, these data do not exist here.

Specific data on passenger miles traveled is not readily available for HST systems in other countries. According to news releases, the Japanese HST system carried approximately 6 billion passengers over 40 years between 1964 and 2004. Over that period there has never been an injury or fatality to people adjacent to the right-of-way. Also, no passenger fatalities have occurred on the Japanese HST system due to derailments or collisions. There have been injuries caused by doors closing on passengers or their belongings. The French TGV is reported to have carried about 1.7 billion passengers between 1981 and 2010. Where the train operated on dedicated track there have been 8 passenger injuries due to derailments and no injuries to people adjacent to the right-of-way. High-speed train service has operated in Germany since 1991. No statistics on passenger-miles-traveled are readily available for the German HST system. The accident on the German HST system reported in Section 3.11, Safety and Security, of the EIR/EIS resulted in 101 fatalities and 87 injuries to passengers but no injuries to people outside the right-of-way. High-speed rail service began in China in 2007. It is reported that the system had 796,000 passengers per day by 2010. As reported in Section 3.11, an accident in 2011 on the Chinese HST system resulted in 40 deaths and 72 injuries. Some of the casualties of this accident were members of the public not riding the train but present in the vicinity of the accident. Although a probability calculation cannot be made for the risk of injury to people adjacent to the California HST System right-of-way, it is clear from the evidence that the risk is very low. HST systems throughout the world have operated for billions of passenger miles for several decades with almost no injuries to people not traveling on the train.

As described in Section 3.11, Safety and Security, because the HST System carries

### L005-110

passengers and would be electrified, there would be no safety hazard associated with HST cargo or fuel, such as fires, explosions, or the release of toxic gases. The hazard of a train collision is the physical impact of the train with structures and people. The FRA has determined that a distance of approximately 102 feet is sufficient to provide protection for accidents associated with the derailment of a freight train adjacent to an HST. It is reasonable to assume that this same distance would apply to collisions between HSTs. In the accidents involving HSTs in Germany and China, the impact zone was within that distance from the HST tracks. Where the HST is at-grade, the edge of right-of-way would typically be about 50 feet from the edge of the HST tracks (see Figure 2-6 in the EIR/EIS). Where the HST is elevated, the HST tracks may be about 15 feet from the edge of the elevated structure (see Figure 2-9 in the EIR/EIS). Therefore, people and structures within about 50 feet of the right-of-way where the HST is at-grade and within about 85 feet of an elevated structure could be at risk from a collision of HSTs. As indicated in the paragraph above, the probability of such an accident is very low.

### L005-111

As stated in the mitigation measure, the fair share will be based on projected passenger use for the first year of operations, with a growth factor for the first 5 years of operation. This cost-sharing agreement will include provisions for ongoing monitoring and future negotiated amendments as the stations are expanded or passenger use increases. Such amendments will be made on a regular basis for the first 5 years of station operation, as will be provided in the agreement. After the first 5 years of operation, the Authority will enter into a new or revised agreement with the public service providers of fire, police, and emergency services to fund the Authority's fair share of services. The fair share will take into account the volume of ridership, past record and trends in service demand at the stations, new local revenues derived from station area development, and any services that the Authority may be providing at the station.

To make sure that services are made available, impact fees will not constitute the sole funding mechanism, although impact fees may be used to fund capital improvements or fixtures (i.e., police substation, additional fire vehicle, onsite defibrillators) necessary to service delivery.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-112**

As discussed in Chapter 2, Alternatives, the project is to be grade-separated and fenced, preventing access by people or wildlife. Impacts on wildlife from the overhead contact system are discussed in Section 3.7 of the EIR/EIS.

### **L005-113**

Refer to Standard Response FB-Response-GENERAL-03, FB-Response-GENERAL-05.

California Planning Law, under the Housing Element requirements (Government Code Section 65580, et seq.), requires cities to accommodate their fair share of the regional housing need, including projected needs for low-income housing. This will apply to future development in the station areas. Further reinforcing this requirement is SB 375 (2008), which will require that the regional housing needs allocations to each city reinforce the “sustainable communities strategies” (SCS) or “alternate planning strategy” (APS) to be adopted by each county council of governments crossed by the Fresno to Bakersfield Section (expected to be adopted in 2014). The SCS or APS is required to set out means to reduce greenhouse gas emissions within the applicable county. These are expected to encourage more compact, city-centered development patterns.

Specifically, as noted in FB-Response-General-3, the HST alternatives are projected to induce more population growth (about 3% more total population) and create additional future employment opportunities (about 4% more total jobs) throughout the entire project area, including communities of concern, than would occur under the No Project alternative. This would provide an overall economic benefit to the region and provide employment opportunities in an area with high unemployment.

As noted in Section 3.12 of the EIR/EIS, under all HST alternatives, benefits associated with the project would likely accrue to a greater degree to communities of concern because they are a large percentage of the population in the region. These benefits include improved mobility within the region, improved traffic conditions on freeways as people increasingly use the HST System, and long-term improvements in air quality within the region. In addition, the Authority will develop special recruitment, training, and job set-aside programs for minority and low-income populations in the area that will help reduce the chronic unemployment problem in these communities (see mitigation

### **L005-113**

measure SO-MM#6).

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, a person displaced from a subsidized housing unit may be offered a comparable public housing unit as a replacement dwelling or they may be offered a unit subsidized under another housing program, e.g., Section 8 Housing Choice Voucher. The EIR/EIS does not include a discussion about impacts to development built using public financial assistance. The City of Bakersfield has not provided evidence that it would in fact be penalized if the Project were to impact affordable housing that was built using public financial assistance, and therefore it would be speculative to discuss public financing implications.

### **L005-114**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-25.

See EIR/EIS Volume I Section 3.12 Mitigation Measures SO-2, SO-3, and SO-4 for proposed mitigation for identified effects in Bakersfield communities. As discussed in Chapter 2, Section 2.3, Potential Alternatives Considered during the Alternatives Screening Process, potential alternatives were evaluated against the HST System performance criteria: travel time, route length, intermodal connections, capital costs, operating costs, and maintenance costs. Screening also included environmental criteria to measure the potential effects of the proposed alternatives on the natural and human environment.

Typically, below-grade construction in urban areas is cost prohibitive due to underground utility infrastructure and in some cases, subsurface cultural resources. While elevated structures are more costly to construct than at-grade profiles, tunnel and trench segments are more costly than both elevated and at-grade track profiles. Please refer to Chapter 5 of the EIR/EIS, Project Costs, for information and breakdown of project costs by alternative.

### **L005-115**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-03.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-115**

The displacement of residential, business, and community facilities will be mitigated for because the Authority will comply with applicable federal and state laws and regulations, including the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. The act and its amendments provide guidance on how federal agencies, or agencies receiving federal financial assistance for a project, will compensate for impacts on property owners or tenants who need to relocate if they are displaced by a project. The Authority will compensate all property owners or tenants in accordance with this act, which applies to all real property.

All benefits and services will be provided equitably without regard to race, color, religion, age, national origins, and disability, as specified under Title VI of the Civil Rights Act of 1964. The Relocation Assistance Program was developed to help displaced individuals move with as little inconvenience as possible and has commonly been used for large infrastructure projects that displace a large number of residences and businesses, such as the HST project, and is considered successful standard practice for mitigating the impacts on individual property owners.

### **L005-116**

Refer to Standard Response FB-Response-SO-01.

Impacts to important facilities that would be relocated in Bakersfield are recognized in EIR/EIS Volume I Section 3.12 Impact SO#6 and Mitigation Measure SO-3.

### **L005-117**

Refer to Standard Response FB-Response-GENERAL-01.

Impacts to the Bakersfield Convention Center overflow parking lot are addressed in Volume I Section 3.12 Impact SO#6 and Mitigation Measure SO-3.

### **L005-118**

Refer to Standard Response FB-Response-SO-07.

The Environmental Justice analysis in the Final EIR/EIS does not claim that East

### **L005-118**

Bakersfield is the only EJ area that the HST rail would affect. The Community Impacts Assessment Technical Report (Authority and FRA 2012h) presented the methodology and detailed information on the locations of environmental justice communities within the study area, see Section 4.3. The report also details the specific communities, facilities, and churches affected by the HST, in sections 5.1, 5.2 and 5.3.

### **L005-119**

Refer to Standard Response FB-Response-SO-07.

### **L005-120**

Refer to Standard Response FB-Response-SO-01.

Impacts on the Bakersfield Homeless Shelter are addressed in EIR/EIS Volume 1 Section 3.12 Impact SO#6 and Mitigation Measure SO-3.

### **L005-121**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-SO-07.

The environmental justice analysis adheres to the definition given by Executive Order 12898 and U.S. Department of Transportation Order 5610.2, which defines an environmental justice effect as a "disproportionately high and adverse effect on minority and low-income populations." This is an adverse effect that is predominately borne by a minority population and/or a low-income population or that would be appreciably more severe or greater in magnitude for the minority and/or a low-income population than the adverse effect that would be suffered by the nonminority and/or non-low-income population along the project.

Section 4.3 in the Community Impact Assessment Technical Report (Authority and FRA 2012h) identifies the environmental justice populations along the project. The methodologies for identifying these populations are detailed in Appendix A of the Community Impact Assessment Technical Report. Section 5.3 in the Community Impact Assessment Technical Report provides detailed information on the potential for substantial environmental justice effects across resources along the project. Volume

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### L005-121

1 Section 3.12 Impacts SO#17 and SO#18 summarize these findings.

### L005-122

The Revised DEIR/Supplemental DEIS must include analysis of implementing both the Fresno to Bakersfield segment and the overall statewide program to address project- and cumulative-level impacts. The overall statewide program analysis is needed to present an accurate cumulative analysis of project build-out of the entire system. It is beyond the scope of the Revised DEIR/Supplement DEIS to speculate on whether or not the entire project would be built.

### L005-123

Section 3.13.5.3 discusses the project's potential compatibility with land uses in the newly developed Mill Creek area. The Mill Creek Linear Park Plan and the Old Town Kern–Pioneer Redevelopment Project are both mixed-use residential and commercial projects in the area of the Bakersfield Station. HST station development would not affect planned development in Bakersfield because those developments are planned for the station study area edges, and include higher-density residential uses that would be compatible with transit-oriented development around stations. Therefore, the project would not contribute to urban decay, as proposed development around the station is intended for the kind of urban area that the HST station would create.

Direct impacts to the South Mill Creek project have been accounted for in the quantitative analysis presented in Section 3.12.8.2.

### L005-124

Refer to Standard Response FB-Response-GENERAL-02.

The comment states that the HST Authority has not worked with local agencies to determine alignment alternatives and that the Revised DEIR/Supplemental DEIS does not accurately state the potentially significant effects of the project. As discussed in FB Response-GENERAL-02: Alternatives, the HST Authority has considered public and agency input received during preparation of the program-level EIR/EIS, including public and agency comments received as part of that scoping process and input received

### L005-124

during ongoing interagency coordination meetings. Additionally, the HST Authority conducted a preliminary alternatives analysis process for the Fresno to Bakersfield Section to identify the potential alternatives for study.

During late 2009 and early 2010, the HST Authority's consultants met several times with City of Bakersfield representatives to review and discuss HST station issues. The first such meeting was held on November 5, 2009. That meeting focused on the station planning and design process and included a discussion of local factors that could affect the layout and design of the HST station (e.g., likely access routes for HST passengers).

Following-up on the November 5th meeting, the HST Authority's consultants met with City of Bakersfield representatives on January 21, 2010, to review three station concepts for each of the two alignments that were under consideration at that time (and which were carried forward into the Revised DEIR/Supplemental DEIS). Each of these concepts showed potential locations for the station building, HST parking facilities, bus transportation facilities, and other ground transportation accommodations, as well as potential opportunities for redevelopment associated with the HST station. These concepts were drawn on aerial images that clearly depicted key features of the station area, including access roadways and existing development. City representatives at the meeting included Alan Tandy, Steve Teglia, Jim Eggert, Raul Rosas, Brad Underwood, Arnold Ramming, and Donna Kunz.

Based on the input received at the January 21st meeting, the HST Authority's consultants met with City staff again on February 24th, 2010. At that meeting, the consultants reviewed more-detailed station concepts for each alignment option, including plan view site drawings, station transverse sections, and passenger platform access scenarios. City representatives at the meeting included Steve Teglia, Jim Eggert, Brad Underwood, Rhonda Barnhard, and Donna Kunz.

On March 31st, 2010, the Authority held a Bakersfield Technical Working Group meeting that included a presentation on planning for the Bakersfield Station. The HST Authority's consultants shared the same material that had been presented at the February 24, 2010, meeting with City staff. This was the first meeting at which the Authority's consultants had discussed the station concepts with anyone other than City staff.

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### L005-124

Following the meetings conducted between November 2009 and March 2010, the Authority's consultants commenced with preparation of the 15% station design drawings that are included in Volume III of the Revised DEIR/Supplemental DEIS.

The comment additionally describes the purpose of the Revised DEIR/Supplemental DEIS and correctly identifies that process for the statement of overriding considerations that the HST Authority will undertake as part of the project adoption and implementation.

Additionally, as the HST project is being undertaken by a state agency (the Authority) and a federal agency (the FRA) it must conform to the policies and objectives of the statutes and regulations under which the Authority and FRA operate. Although the Authority and FRA respect the role of local agencies to adopt local planning policies, the Authority and FRA are not bound by those policies and must independently discharge their statutory responsibilities relative to the HST project.

### L005-125

The comment states that potential areas for parking needed for the Bakersfield station are not properly identified and that the unspecified mitigation measure at an unspecified time is improper deferral of mitigation. As stated in Section 3.13.5.3, the demand for parking at the Bakersfield station would increase as ridership and population in the Bakersfield area increases. While it is unknown at this time when additional parking would be needed and where it would be provided, additional parking areas are being identified in the downtown area to accommodate both passengers and visitors to the station area. Parking for the downtown Bakersfield HST station would be located near the station or dispersed throughout the downtown areas for the station.

As stated in FB-Response-GENERAL-06, Relationship of the Authority's Business Plan to the Analysis in the EIR/EIS, the Revised DEIR/Supplemental DEIS analysis of high forecasts for parking provides flexibility over time to reduce the amount of station parking based on more refined demand projections and transit-oriented development around station areas. Land use development around the HST stations is assumed in the Revised DEIR/Supplemental DEIS to occur over time. The amount of nearby development as well as the future availability of local transit connections, both of which tend to decrease parking demand, will influence the future need for parking.

### L005-125

The Authority and FRA would therefore retain the flexibility to make decisions about what parking facilities to construct initially and how additional parking might be phased or adjusted depending on how the HST System ridership increases over time. For example, it is possible that some parking facilities might be constructed at the 2020 project opening, only to be replaced in whole or in part, or augmented later with development or other parking facilities (see Section 2.5.3).

### L005-126

As described in Section 3.13.4.1 of the Revised DEIR/Supplemental DEIS, approximately 84 miles of the proposed BNSF Alternative would be located adjacent to or within the existing rail right-of-way. The BNSF Alternative predominantly passes through agricultural and transportation right-of-way areas. Other existing land uses along the alignment include industrial, community facility, agricultural, single-family and multifamily residential, and commercial uses.

The Revised DEIR/Supplemental DEIS further states that within the city of Bakersfield, the corridor is characterized by industrial uses associated with oil-related businesses and rail yards. The downtown portion of the alignment, however, is a predominantly commercial and community facility with considerable areas of vacant and underused land. East of the Downtown Bakersfield station area, existing land uses are generally residential and service commercial.

### L005-127

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-08.

As discussed in Standard Response FB-Response-GENERAL-02, Alternatives, the HST Authority, informed by the program-level EIR/EISs, public and agency comments received as part of the scoping process, and input received during ongoing interagency coordination meetings, conducted a preliminary alternatives analysis process for the Fresno to Bakersfield Section to identify the potential alternatives for study.

Additionally, as discussed in Standard Response FB Response-GENERAL-02, Alternatives, the Authority and FRA have eliminated potential "new corridor" alignment

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-127**

alternatives to the west and east of SR 99 from further consideration and have identified downtown station locations for study in Fresno and Bakersfield. These downtown locations would help to minimize impacts on agriculture while promoting urban infill development. Optimizing the alternative alignments in the city of Bakersfield has helped to reduce or avoid impacts to properties and roadways in the city of Bakersfield to the extent feasible.

### **L005-128**

Refer to Standard Response FB-Response-GENERAL-02.

The alignment alternatives evaluated in the Revised DEIR/Supplemental DEIS were predicated on the Program EIR/EIS (Authority and FRA 2005). The Program EIR/EIS identified the area near the Bakersfield Amtrak station in Downtown Bakersfield as the preferred location for an HST station. This conclusion was based, in part, on preferences expressed by the City of Bakersfield, Kern County, Kern Council of Governments, and the Kern County Transportation Foundation that were stated during the Program EIR/EIS process. Thus, the alignments under consideration were specifically intended to accommodate a station at that location. No other alignments considered as part of the Program EIR/EIS, or subsequently, would achieve the locally expressed objective of a Downtown Bakersfield HST station.

As discussed in Standard Response FB Response-GENERAL-02: Alternatives, the HST Authority has considered public and agency input received during preparation of the program-level EIR/EIS, including public and agency comments received as part of that scoping process and input received during ongoing interagency coordination meetings. Additionally, the HST Authority conducted a preliminary alternatives analysis process for the Fresno to Bakersfield Section to identify the potential alternatives for study.

During late 2009 and early 2010, the HST Authority's consultants met several times with City of Bakersfield representatives to review and discuss HST station issues. The first such meeting was held on November 5, 2009. That meeting focused on the station planning and design process and included a discussion of local factors that could affect the layout and design of the HST station (e.g., likely access routes for HST passengers).

### **L005-128**

Following-up on the November 5th meeting, the HST Authority's consultants met with City of Bakersfield representatives on January 21, 2010, to review three station concepts for each of the two alignments that were under consideration at that time (and which were carried forward into the Revised DEIR/Supplemental DEIS). Each of these concepts showed potential locations for the station building, HST parking facilities, bus transportation facilities, and other ground transportation accommodations, as well as potential opportunities for redevelopment associated with the HST station. These concepts were drawn on aerial images that clearly depicted key features of the station area, including access roadways and existing development. City representatives at the meeting included Alan Tandy, Steve Teglia, Jim Eggert, Raul Rosas, Brad Underwood, Arnold Ramming, and Donna Kunz.

Based on the input received at the January 21st meeting, the HST Authority's consultants met with City staff again on February 24th, 2010. At that meeting, the consultants reviewed more-detailed station concepts for each alignment option, including plan view site drawings, station transverse sections, and passenger platform access scenarios. City representatives at the meeting included Steve Teglia, Jim Eggert, Brad Underwood, Rhonda Barnhard, and Donna Kunz.

On March 31st, 2010, the Authority held a Bakersfield Technical Working Group meeting that included a presentation on planning for the Bakersfield Station. The HST Authority's consultants shared the same material that had been presented at the February 24, 2010, meeting with City staff. This was the first meeting at which the Authority's consultants had discussed the station concepts with anyone other than City staff.

Following the meetings conducted between November 2009 and March 2010, the Authority's consultants commenced with preparation of the 15% station design drawings that are included in Volume III of the Revised DEIR/Supplemental DEIS.

The comment additionally describes the purpose of the Revised DEIR/Supplemental DEIS and correctly identifies that process for the statement of overriding considerations that the HST Authority will undertake as part of the project adoption and implementation.

Additionally, as the HST project is being undertaken by a state agency (the Authority)

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-128**

and a federal agency (the FRA), it must conform to the policies and objectives of the statutes and regulations under which the Authority and FRA operate. Although the Authority and FRA respect the role of local agencies to adopt local planning policies, the Authority and FRA are not bound by those policies and must independently discharge their statutory responsibilities relative to the HST project.

### **L005-129**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-21, FB-Response-LU-03.

As discussed in Section 3.13.5.3 of the Revised DEIR/Supplemental DEIS, HST station development would not affect planned development in Bakersfield, including the Mill Creek Linear Park Plan and the Old Town Kern–Pioneer Redevelopment Project, because those developments are planned for the station study area edges and include higher-density residential uses that would be compatible with transit-oriented development (TOD) around stations. Short-term cumulative impacts from project construction could result in potential cumulative impacts from noise and visual changes to Mill Creek Linear Park. However, as explained in Section 3.13.5.3 of the Revised DEIR/Supplemental DEIS, long-term cumulative impacts of Mill Creek Linear Park and the HST alternatives would result in beneficial impacts by developing industrial areas with very low existing visual quality with development with moderately high visual quality.

Furthermore, the Revised DEIR/Supplemental DEIS states that the HST alternatives would result in the permanent conversion of land to transportation uses, which in many locations would be incompatible with existing land uses. Although the amount of land affected by the conversion of uses under the HST alternatives would be a relatively small percent of the four-county study area (approximately 4,000 acres, or less than 0.01%), there is the potential for significant land use incompatibilities to occur. As stated in Section 3.19.4 of the Revised DEIR/Supplemental DEIS, cumulative land use impacts would be substantial under NEPA and significant under CEQA because of changes in land use that could result from implementation of the HST alternatives. The HST alternatives' contribution to this impact would be substantial under NEPA, and cumulatively considerable under CEQA.

### **L005-129**

The comment is correct in noting that the HST project is not a critical element of the City's General Plan and also states that the Revised DEIR/Supplemental DEIS should acknowledge that the City of Bakersfield's current General Plan encourages mixed use and infill development.

Lastly, the comment states that the Revised DEIR/Supplemental DEIS fails to disclose and analyze the project's significant impacts on existing and planned TOD projects in the city. Individual properties and projects were analyzed consistent with CEQA guidelines. The level of detail in the environmental analysis is to "correspond to the degree of specificity involved in the underlying activity which is described in the EIR" (14 CCR 15146). Therefore, the Revised DEIR/Supplemental DEIS is based on the level of engineering and planning necessary to identify potential environmental impacts and to identify the appropriate mitigation measures. In addition, Table 3.19-A-8 of Appendix 3.19-A includes the following projects for analysis of cumulative impacts:

- Metropolitan Bakersfield General Plan (EIR)
- Seventh Standard Substation Project (MND)
- Rosedale Ranch Project (EIR)
- CUP #08-1795 (MND)
- Bakersfield Commons (EIR)
- California State University Bakersfield Baseball Facility Improvements (ND)
- CUP #07-0315 (MND)
- Mill Creek Linear Park Plan (Environmental Assessment)
- Old Town Kern-Pioneer Redevelopment Project (EIR)
- The Canyons: Bakersfield, CA (Supplemental EIR)

### **L005-130**

Refer to Standard Response FB-Response-GENERAL-21.

The methodology used to determine impacts is described in Section 3.13.3 of the Revised DEIR/Supplemental DEIS. Under NEPA, a land use impact with negligible intensity is defined as a change in land use that would be measurable, but not perceptible, and that would be consistent with applicable plans and policies. For land use, this means changing a commercial-only development to mixed use, but not

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-130**

changing the footprint of the structure. The change would be measurable in that the land use would be slightly different but would not be perceptible to the casual viewer, nor would it impact the physical environment. Under CEQA, the project would have a significant impact if it would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigation an environmental effect, or if it causes a substantial change in pattern or intensity of land use incompatible with adjacent land uses.

The analysis determined that, across the section, although construction would result in temporary and intermittent disruption of access to some properties and temporarily inconvenience some residents, construction is not anticipated to cause adjacent land use changes. Heavy construction in urban areas occurs across the state with adjacent land uses being temporarily disrupted, but not permanently changing the nature or intensity of the adjacent land use.

### **L005-131**

Refer to Standard Response FB-Response-SO-04, FB-Response-AVR-03, FB-Response-AVR-04.

For information on the potential for disruption and division in Bakersfield, see Volume I, Section 3.12, Impact SO#6. For information on the impacts on the potential for physical deterioration, see Section 5.4.5 of the

*Fresno to Bakersfield Section: Community Impact Assessment Technical Report* (Authority and FRA 2012a).

Mitigation Measures SO-2 and SO-3 propose mitigations for identified effects in Bakersfield communities.

Only compatible land use, as determined first by the FRA and Department of Homeland Security and then as approved by the local jurisdiction's land use plan would be placed under the elevated guideway. See Volume I, Chapter 2 for information on the maintenance of the right-of-way, aerial structures, and bridge sections of the alignment, which would include drain cleaning, vegetation control, litter removal, and other inspections that would typically occur monthly to several times a year.

### **L005-132**

As described in Section 3.2.5.3, the HST alternatives would divert trips from air travel in the area, primarily from Fresno Yosemite International Airport. The Statewide High-Speed train ridership model projected where trips would be diverted and whether the diversions would be from automobiles or airplane trips; an estimated 23% of passengers at the Fresno and Bakersfield airports would be diverted to the HST within the San Joaquin Valley (Authority 2012a) [page 3.2-70]. Air travel provides a flexible form of transportation wherein scheduled flights are added or discontinued according to demand. However, flights would not be reduced to the extent that it would create a need for closure of a regional airport that would contribute to urban decay.

### **L005-133**

The discussion of HST operational impacts on park character is examined in Impact PK #4 – Project Changes to Park Character, in Section 3.15, Parks, Recreation, and Open Space, of the Final EIR/EIS. The page numbers mentioned indicate that the comment is based on the circulated 2011 Draft EIR/EIS. A revised analysis determined that the project would substantially degrade the existing visual character and quality of the site and its surroundings and would therefore have an effect of substantial intensity under the National Environmental Policy Act (NEPA) and a significant impact under the California Environmental Quality Act (CEQA). The revised analysis also determined that the HST operational noise would increase noise exposure for users of the parkway and facilities. Therefore, operational noise impacts would have an effect of moderate intensity under NEPA and a significant impact under CEQA.

Refer to Mitigation Measures N&V-MM#3: Implement Proposed California High-Speed Train Project Noise Mitigation Guidelines, in Section 3.4, Noise and Vibration, and AVR-MM#2a through #2f in Section 3.16, Aesthetics and Visual Resources, for further discussion of the mitigation measures.

### **L005-134**

The quotation refers to a statement from the earlier, broad-scale Statewide Programmatic EIR/EIS (Authority and FRA 2005). However as stated in the sentence that follows, the project-level analysis in the Revised DEIR/Supplemental DEIS identifies various potential impacts in both rural and urban settings. Specifically, significant visual impacts were identified in numerous situations in the city of Bakersfield. These impacts

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-134**

are discussed in detail under each of the representative key viewpoints (KVPs) in the city.

### **L005-135**

Refer to Standard Response FB-Response-AVR-03.

As stated in Standard Response AVR-03, the Authority will work with local jurisdictions to develop appropriate aesthetic/visual treatments for various project features. Implementation of mitigation measures will be coordinated during final design and specified to the HST design-build contractor. Section 3.16.7, Mitigation Measures, in the Revised DEIR/Supplemental DEIS describes various methods for minimizing and mitigating the impacts of constructing and operating the HST project. The EIR/EIS does not defer mitigation, but rather provides an extensive set of mitigation measures using performance standards that will be refined, and applied as design progresses and permits are obtained, in consultation with local jurisdictions.

### **L005-136**

Refer to Standard Response FB-Response-AVR-03.

Mitigation Measure VQ-MM#3 has been modified in the Revised DEIR/Supplemental DEIS to further specify how impacts are to be addressed. As called for under Mitigation Measure AVR-MM#2a, during final design the Authority will coordinate with the city and establish a process to advance the final design through a collaborative, context-sensitive approach. Participants in the consultation process will meet on a regular basis to develop a consensus on the urban design elements to be incorporated into final design. The process will include activities to solicit community input. Mitigation Measure AVR-MM#2a also specifies various performance standards to be applied to the design of various major project elements. As stated in the measure, during the specified context-sensitive solutions design process, the HST project's obligations and constraints related to planning, mitigation, engineering, performance, funding and operational requirements will be determined.

### **L005-137**

Refer to Standard Response FB-Response-SO-01, FB-Response-GENERAL-25.

As stated in Mitigation Measure AVR-MM#2a, during the specified context-sensitive solutions design process, the HST project's obligations and constraints related to planning, mitigation, engineering, performance, funding, and operational requirements will be determined.

There are three proposed alternative alignments through Bakersfield: the BNSF Alternative, the Bakersfield South Alternative, and the Bakersfield Hybrid Alternative. Each alternative would have its own set of different effects on Bakersfield. Each alternative is proposed to be elevated because construction-elevated sections have fewer on-the-ground impacts than at-grade sections.

The Authority used the information in the Revised DEIR/Supplemental DEIS and input from agencies and the public to identify the Preferred Alternative. The decision included consideration of the project purpose and need and the project objectives presented in Chapter 1, Project Purpose, Need, and Objectives, of the EIR/EIS as well as the objectives and criteria in the alternatives analysis and the comparative potential for environmental impacts. For more information on the Bakersfield alternatives, refer to Standard Response GENERAL-25. For more detail on selection of the Preferred Alternative, refer to Chapter 7 of this Final EIR/EIS.

The HST project could be placed below-grade through urban areas in a cut embankment with 2:1 slopes, a vertical trench with concrete walls, or a tunnel. As described in Chapter 2, Alternatives, of the EIR/EIS, the electrical contact system for the trains would consist of a series of mast poles approximately 23.5 feet higher than the top of the rail. Therefore, the HST would need to be at a depth of about 40 feet for the whole system to be below-grade.

A cut embankment through urban areas was not considered feasible because of the required width of the right-of-way. With 2:1 slopes, a 40-foot-deep cut with a bottom width of 120 feet would have a width at the surface of 160 feet. This would result in a substantial increase in the number of properties that would have to be acquired in urban areas, resulting in greater impacts to the communities crossed by the project.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

### **L005-137**

Placing the HST project in a trench or tunnel would increase the cost of crossing urban areas by more than one to two orders of magnitude, making the project economically infeasible. The costs of constructing an at-grade foundation for HST tracks, a 40-foot-deep trench, and a tunnel were estimated using the unit-price analysis method, as described in Engineering Technical Memoranda 1.1.19 and 1.1.22 (available on the Authority website). This method of cost estimating was typically used to develop costs for complex construction elements, including but not limited to viaducts, retained-earth systems, tunneling, and underground structures.

This method allows for unit prices to be developed based on current local construction and market conditions, such as changes that might affect productivity or the cost of labor or materials. The following steps were used to develop a unit price using this method:

- Analyze the proposed construction conditions
- Estimate production rates
- Compile a list of materials
- Obtain materials prices using local available sources
- Determine labor and equipment rates
- Calculate direct unit price using the above factors
- Add allowances for contractor overhead and profit to arrive at an in-place unit price

The following sources will be used to obtain basic cost data that were input into the database estimating program to develop construction unit prices:

- Labor rates – Federal Davis-Bacon wage determination and/or California Department of Industrial Relations prevailing wage determinations.
- Equipment rates – R.S. Means and/or U.S. Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule, Region VII.
- Material prices - Material and supply prices for locally available material were obtained from local supplier quotes, if possible. Secondary sources of material cost data were taken from R.S. Means, Engineering News-Report (ENR) or other published resource.

The civil construction costs (i.e., the costs of clearing the right-of-way and constructing

### **L005-137**

the embankment for the HST rails and contact system) for an at-grade section of the HST system are estimated to be about \$2.5 million/mile. The civil construction costs for an elevated structure like that proposed for Downtown Bakersfield is a maximum of about \$84 million/mile. The civil construction costs for a 40-foot-deep trench would be approximately \$121 million/mile for two tracks. The civil construction costs for a tunnel would depend on the soil conditions in the area and the type of tunneling method, but would vary from approximately \$183 to \$495 million/mile for two tracks. The HST project would cross approximately 13 miles of urban area in Fresno and 12 miles of urban area in Bakersfield. Assuming that the alignment would be at-grade in Fresno except where it crosses under State Route (SR) 180 and Jensen Avenue and 2 miles would be at-grade in Bakersfield, with the remaining 10 miles on elevated structure, placing the HST project in a trench through both communities would increase the project cost by about \$2.7 billion. Placing the HST project in a tunnel through both cities would increase project costs from about \$5 billion to \$16 billion.

### **L005-138**

The Revised DEIR/Supplemental DEIS has been revised to reflect the historic status of SR-204 (Union Avenue), see Chapter 3.17, Cultural and Paleontological Resources. Union Avenue has been considered for potential impacts and the project is not expected to cause significant impacts (no adverse effects) to the resource.

### **L005-139**

Refer to Standard Response FB-Response-GENERAL-24.

This typographical error is not reflected in the assumptions used to estimate future growth and ridership. The EIR/EIS provides a reasonable growth scenario based on the research and projections of Cambridge Systematics, Inc., a reputable firm that specializes in such work. The Cambridge Systematics ridership model was based on population projections taken from multiple sources (including the Census, the California Department of Finance, and the Institute of Urban and Regional Development) and was made at the county level. The commenter is concerned about the 2035 population projection number presented for the city of Bakersfield, which was incorrect in the Revised DEIR/Supplemental DEIS. This error has been corrected in the Final EIR/EIS to 609,600 (source: Kern Council of Governments, 2011 Final Regional Transportation Plan [KCOG 2010]). Because the error came from a 2007 Kern Council of Governments

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### L005-139

source and Cambridge Systematics, Inc., did not use this data source in its ridership models, no error could have resulted.

### L005-140

Refer to Standard Response FB-Response-GENERAL-03.

Growth is expected to occur in the region under the No Project Alternative and with the HST System. The cities of Fresno and Bakersfield already have existing general plan policies promoting higher-density downtowns, have undertaken redevelopment activities to help revitalize their downtowns, and are considering stronger general plan policies that would promote mixed uses near the HST stations. The San Joaquin Valley Blueprint generally encourages higher-density development near the stations of the proposed HST System. The "sustainable communities strategies" or "alternative planning strategies" to be adopted by the Metropolitan Planning Agencies in Fresno, Kings, Tulare, and Kern counties pursuant to Senate Bill (SB) 375 (2008) are expected to include policies and transportation funding incentives that will encourage compact development patterns to meet the region's greenhouse gas (GHG) reduction targets for automobiles and light trucks (5% by 2020, 10% by 2035). Therefore the project is not only consistent with existing local plans in Bakersfield and Fresno, the project would actually help create a market and help local governments harness this market for intensified development near HST stations, in furtherance of those plans, to accommodate the needs of HST riders. That market driver would not exist without the HST System. The HST project will indirectly change the real estate market by providing an economic driver for revitalization and new investment in areas near the stations.

### L005-141

Footnote 3 in Section 3.18, Regional Growth, describes the distinction between jobs and annual job years. A 1-year full-time job equivalent is one person fully employed for 1 year. See also Impacts SO #5 and SO #13 in EIR/EIS Volume I Section 3.12, Socioeconomics, Communities, and Environmental Justice, for information on project job creation during construction and operation.

### L005-142

The report cited in the comment is critical of the ridership forecasts, revenue assumptions, and job creation forecasts, however the analysis in the EIR/EIS is comprehensive and follows industry-accepted methodologies. Since this report was released, the Authority has produced a Revised 2012 Business Plan, which updates ridership forecasts and project costs. The U.S. Government Accountability Office, an independent and nonpartisan agency that works for Congress, released a report in March 2013 which found that the Authority's ridership and revenue forecasts are reasonable.

For information on new job creation and the resulting impacts to the regional economy see Volume I Chapter 3.12 Impact SO#5 and SO #13. Also see section 5.1.2 of the Community Impact Assessment Technical Report for more detailed information on the methodology used for short-term and long-term job creation analysis.

Chapter 5, Project Costs, provides the detailed capital costs developed for each of the alternatives, including the design options, for the Fresno to Bakersfield Section of the HST project. For this analysis, some of the costs for right-of-way acquisition, final design, and program implementation were removed because those costs would not measurably affect employment in the region.

Not all the construction costs would be spent locally in the four-county study area. Materials from outside of the study area would be used to construct the HST system (i.e., concrete sections of the guideway, train sections, and quarry materials). Experts in the transportation field helped derive the local portions of these costs as well as the portion spent during each of the years of construction. These costs were used with the RIMS II multipliers for the four-county study area to derive the indirect and induced employment impacts of the project. The direct regional employment estimates were derived by dividing the local construction payroll by an annual average construction wage of \$156,000. The \$156,000 annual average wage is the actual cost of the construction workers based on an average hourly wage (including benefits) of \$75.

The resulting estimate includes the number of direct jobs created as well as the indirect and induced employment. Direct employment refers to the jobs created to construct the project and primarily involves jobs created in the construction sector. Indirect

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-142**

employment refers to the jobs created in existing businesses in the region (e.g., material and equipment suppliers) that supply goods and services to project construction. Induced employment refers to jobs created in new or existing businesses (e.g., retail stores, gas stations, banks, restaurants, service companies) that supply goods and services to workers and their families.

### **L005-143**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-20, FB-Response-SO-06.

The entire HST System has been analyzed at a programmatic level, and tiered environmental review documents that address HST section impacts at a project level, such as this Revised DEIR/Supplemental DEIS for the Fresno to Bakersfield Section, are under preparation.

### **L005-144**

Impacts on important facilities that would be relocated in Bakersfield are recognized in the EIR/EIS, Volume I, Section 3.12, Impact SO #6, and Mitigation Measure SO-3.

### **L005-145**

Refer to Standard Response FB-Response-GENERAL-02.

The procedural requirements for NEPA and CEQA were followed during the environmental review of the Fresno to Bakersfield HST Section.

The Authority and the FRA's prior Program EIR/EIS documents (refer to Section 1.5, Tiering of Program EIR/EIS Documents) selected the BNSF Railway route as the preferred alternative for the Central Valley HST between Fresno and Bakersfield in the 2005 Statewide Program EIR/EIS decision document. Therefore, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF Railway corridor.

As discussed in Section 2.3.1 of the EIR/EIS, the Authority implemented an alternatives

### **L005-145**

analysis process to identify the full range of reasonable alternatives for the project, as required under 14 CCR 15126.6 and 40 CFR 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF corridor.

The station locations are designed primarily to tie into the existing transportation network. City centers are where existing transit facilities are and typically have good connections to the existing highway system. The Authority has not ignored the City of Bakersfield's concerns and suggestions. Input from the City of Bakersfield has been taken into consideration in project planning since the project was initiated. The Bakersfield station was located in downtown Bakersfield adjacent to the Amtrak station at the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments (COG). The Revised DEIR/Supplemental DEIS was modified to include information provided by the City of Bakersfield.

### **L005-146**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-04, FB-Response-SO-05.

For information on the potential for disruption and division in Bakersfield, refer to Section 3.12 of the EIR/EIS, Impact SO#6. Also refer to Impact SO#9 and Impact SO#10 for displacement estimates in Bakersfield. Mitigation Measures SO-2 and SO-3 propose mitigations for identified effects in Bakersfield communities. The Community Impacts Assessment Technical Report details the specific communities, facilities, and churches impacted by the HST in Sections 5.1, 5.2 and 5.3.

For information on the HST operation-related property and sales tax revenue effects, refer to Section 3.12, Impact SO#3, Impact SO#4, and Impact SO #12. While some community churches would have to be relocated, this is not considered an infringement on religious freedom. Details on the business analysis, including type of businesses affected, vacancies, and number of employees potentially affected, are included in Section 5.2.3 of the Community Impact Assessment Technical Report.

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-146**

Also refer to Section 5.1.2 of the Community Impact Assessment Technical Report for more detailed information on short-term and long-term job creation.

### **L005-147**

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-GENERAL-19.

### **L005-148**

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-GENERAL-11.

### **L005-149**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-04.

For information on the impacts to the Full Gospel Lighthouse in Bakersfield, refer to sections 5.1.1 and 5.2.5 in the Community Impact Assessment Technical Report and to Section 3.12 of the EIR/EIS, Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities. The Authority will consult with the affected parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and also to ensure relocation that allows the community currently served to continue to access these services.

### **L005-150**

The Department of Parks and Recreation (DPR) forms for the Fresno to Bakersfield Section of the California High-Speed Train System are provided in the Historic Architectural Survey Report (HASR) (Authority and FRA 2011b) and the Historic Property Survey Report (HPSR) (Authority and FRA 2011c), prepared for the Draft EIR/EIS, and the Supplemental HASR (Authority and FRA 2012l) and Supplemental HPSR (Authority and FRA 2012m), prepared for the Revised DEIR/Supplemental DEIS. To protect cultural resources, these reports and forms were not distributed to the public at large. They are available to qualified historians and archaeologists on request to the Authority and FRA. Requests for these reports were made by several qualified individuals in Bakersfield and Kern County, and copies of the reports were provided to them.

### **L005-151**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-04.

The Final EIR/EIS includes specific information on the potential impacts on the First Free Will Baptist Church and associated Bethel Christian School. The school would be displaced under the Bakersfield South Alternative, but would not be displaced under the BNSF Alternative or Bakersfield Hybrid Alternative. The potential impacts on the church and school are described in Section 3.12, Impact SO #6- Disruption to Community Cohesion or Division of Existing Communities from Project Operation. Mitigation is included in Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities. Also, refer to Section 5.2.5, Community Facilities, of the Community Impact Assessment Technical Report for the impacts on the church and school, as well as to Section 5.2.6, Potential Mitigations for Property Displacements and Relocations, where the mitigation measures related to the potential relocation of the facilities are detailed.

Refer to Section 3.4, Noise and Vibration, Impact N&V #3- Moderate and Severe Noise Impacts from Project Operation to Sensitive Receivers, for noise impacts on Bethel Christian School. Mitigation is presented in N&V-MM#3: Implement Proposed California High-Speed Train Project Noise Mitigation Guidelines. The potential sound barrier mitigation for this area for operation noise of the project is listed in Tables 3.4-29, 3.4-31 and 3.4-32 and shown in Figure 3.4-19, Bakersfield area: Potential sound barrier sites. The specific type of mitigation will be selected during final design and before operations begin.

### **L005-152**

Refer to Standard Response FB-Response-N&V-02, FB-Response-N&V-03, FB-Response-N&V-05.

### **L005-153**

Refer to Standard Response FB-Response-SO-01.

For information on the impacts to the Full Gospel Lighthouse in Bakersfield, refer to sections 5.1.1 and 5.2.5 in the Community Impact Assessment Technical Report. Also

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-153**

refer to Section 3.12 of the EIR/EIS, Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities. The Authority will consult with the affected parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and also to ensure relocation that allows the community currently served to continue to access these services.

### **L005-154**

Refer to Standard Response FB-Response-GENERAL-16, FB-Response-GENERAL-07.

The Authority remains committed to engaging with Kern County, the City of Bakersfield, and all impacted municipalities as the project progresses. Efforts to date to solicit feedback and modify the project based on that feedback resulted in the addition of the Bakersfield Hybrid Alternative. Unfortunately, not every opinion from the community on alignment alternatives can be acted upon; the intent of the introduction of the Bakersfield Hybrid Alternative was to offer an alternative with less impacts on Bakersfield.

The public outreach process for the Fresno to Bakersfield Section of the HST has been extensive and includes hundreds of public meetings and briefings where public comments have been received and participation in community events where participation has been solicited. Also, educational materials have been developed and distributed to encourage feedback. These efforts are cited in Chapter 7 of the Revised DEIR/Supplemental DEIS. Public notification regarding the draft environmental documents included a notification letter, informational brochure, and NOA prepared in English and Spanish and sent to landowners and tenants within 300 feet of all proposed alignment alternatives. The letters notified landowners and tenants that their property could become necessary for construction (within the project construction footprint) of one or more of the proposed alignment alternatives or project components being evaluated. Anyone who has requested to be notified or is in our stakeholder database was sent notification materials in English and Spanish. An e-mail communication of the notification materials was distributed to the entire stakeholder database. Public notices were placed in English and Spanish newspapers. Posters in English and Spanish were posted along the project right-of-way.

### **L005-154**

The Revised DEIR/Supplemental DEIS with technical appendices totals approximately 4,000 pages. As stated in Section 15140 of the CEQA Guidelines "EIRs shall be written in plain language and may use appropriate graphics so that decision makers and the public can rapidly understand the documents." That guidance was followed in preparing this EIR/EIS.

Because the Fresno to Bakersfield Section alignment alternatives extend south of the project's southern terminus at Baker Street, the impact analysis presented in this Revised DEIR/Supplemental DEIS extends through Bakersfield to Oswell Street in order to provide analysis and comparison of impacts for the full length of alignment alternatives carried forward. Mitigation measures have been recommended for significant impacts identified within the Fresno to Bakersfield Revised DEIR/Supplemental DEIS study area. The Bakersfield to Palmdale Section EIR/EIS will assess impacts east of Oswell Street to Palmdale.

### **L005-155**

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-GENERAL-17, FB-Response-GENERAL-18, FB-Response-GENERAL-19.

For information on new job creation and the resulting impacts on the regional economy, see Volume I, Section 3.12, Impact SO#5 and SO #13. Also see section 5.1.2 of the Community Impact Assessment Technical Report for more detailed information on the methodology used for short-term and long-term job creation analysis. Details on the business analysis, including type of businesses affected, vacancies, and number of employees potentially affected, are included in section 5.2.3 of the Community Impact Assessment Technical Report.

### **L005-156**

Refer to Standard Response FB-Response-GENERAL-17, FB-Response-GENERAL-14.

### **L005-157**

Refer to Standard Response FB-Response-SO-04.

## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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### **L005-157**

Impacts on important facilities that would be relocated in Bakersfield are recognized in Volume I, Section 3.12, Impact SO#6 and Mitigation Measure SO-3. Also refer to Impact SO#9 and Impact SO#10 for displacement estimates in Bakersfield. Mitigation Measures SO-2 and SO-3 propose mitigations for identified effects in Bakersfield communities.

### **L005-158**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-04, FB-Response-GENERAL-16.

The Authority will consult with the affected parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and also to ensure relocation that allows the community currently served to continue to access these services.

For information on the impacts to the Full Gospel Lighthouse in Bakersfield, refer to sections 5.1.1 and 5.2.5 in the Community Impact Assessment Technical Report. Also refer to Section 3.12 of the EIR/EIS, Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities.

### **L005-159**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-04.

### **L005-160**

Refer to Standard Response FB-Response-SO-01, FB-Response-SO-08, FB-Response-GENERAL-02, FB-Response-SO-04.

### **L005-161**

Refer to Standard Response FB-Response-SO-01.

The public outreach process for the Fresno to Bakersfield section of the HST has been extensive and includes hundreds of public meetings and briefings where public

### **L005-161**

comments have been received and participation in community events where participation has been solicited. Also, educational materials have been developed and distributed to encourage feedback. These efforts are cited in Chapter 7 of the Revised DEIR/Supplemental DEIS. Public notification regarding the draft environmental documents included a notification letter, informational brochure, and NOA, which were prepared in English and Spanish and sent to landowners and tenants within 300 feet of all alignment alternatives. The letters notified landowners and tenants that their property may be necessary for construction (within the project construction footprint) of one or more of the alignment alternatives or project components being evaluated. Anyone who has requested to be notified or is in the stakeholder database was sent notification materials in English and Spanish. An e-mail communication of the notification materials was distributed to the entire stakeholder database. Public notices were placed in English and Spanish newspapers. Posters in English and Spanish were posted along the project right-of-way.

### **L005-162**

Refer to Standard Response FB-Response-GENERAL-16.

The public outreach process for the Fresno to Bakersfield Section of the HST has been extensive and includes hundreds of public meetings and briefings where public comments have been received and participation in community events where participation has been solicited. Also, educational materials have been developed and distributed to encourage feedback. These efforts are cited in Chapter 7 of the Revised DEIR/Supplemental DEIS. Public notification regarding the draft environmental documents included a notification letter, informational brochure, and NOA, which were prepared in English and Spanish and sent to landowners and tenants within 300 feet of all proposed alignment alternatives. The letters notified landowners and tenants that their property could become necessary for construction (within the project construction footprint) of one or more of the proposed alignment alternatives or project components being evaluated. Anyone who has requested to be notified or is in the stakeholder database was sent notification materials in English and Spanish. An e-mail communication of the notification materials was distributed to the entire stakeholder database. Public notices were placed in English and Spanish newspapers. Posters in English and Spanish were posted along the project right-of-way.

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## Response to Submission L005 (Jim Eggert, City of Bakersfield, October 19, 2012) - Continued

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**L005-163**

Refer to Standard Response FB-Response-SO-01.

The Community Impact Assessment Technical Report details the specific religious institutions affected by the HST project. Impacts on religious facilities that would be relocated in Bakersfield are identified in Volume I, Section 3.12 of the EIR/EIS. While some community churches would be relocated, it is not considered an infringement on religious freedom.

Please refer to Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities. These measures will apply to schools, churches, city and county property, as well as other important facilities. The Authority will consult with these respective parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and also to ensure relocation that allows the community currently served to continue to access these services. This mitigation measure will be effective in minimizing the impacts of the project by completing new facilities before necessary relocations and by involving affected facilities in the process of identifying new locations for their operations.

**L005-164**

Refer to Standard Response FB-Response-GENERAL-17, FB-Response-GENERAL-02, FB-Response-SO-04.

The California High-Speed Train (HST) Project is managed by the California High-Speed Rail Authority (Authority), which is also the CEQA lead agency. The Federal Railroad Administration (FRA) is the federal lead agency under NEPA. Funding for the proposed project is coming from both federal and state sources.

The proposed HST project is not exempt from CEQA. The Authority and FRA are complying with CEQA and NEPA as demonstrated by completion of the Program EIR/EIS, the original Draft EIR/EIS for the Fresno to Bakersfield section and the Revised DEIR/Supplemental DEIS for the Fresno to Bakersfield Section.

**L005-165**

Refer to Standard Response FB-Response-GENERAL-07.

**L005-166**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-07, FB-Response-GENERAL-16.

Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012)



October 17, 2012

Jeff Morales  
Chief Executive Officer  
High Speed Rail Authority  
770 L Street, Suite 800  
Sacramento, CA 95814

Mr. Morales,

Enclosed you will find City of Corcoran Resolution No. 2653 and referenced exhibits which comprise the City's formal comments to the Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement.

The comments being submitted to the High Speed Rail Authority were generated from the input of local residents, business owners, and other stakeholders as presented to the City Council during public forums over the course of several months. Individuals who provided comments during the various council meetings represent a diverse cross-section of the community and are directly or indirectly affected by the three proposed alignments in Corcoran and its sphere of influence.

As has been reiterated in earlier documents, the City of Corcoran opposes all three proposed routes. However, as the alignments have been analyzed in greater detail, it has become apparent that the two in-town routes are the most detrimental to the City. From a land use and planning perspective, the impacts are significant and devastating. Moreover, the long-term effects of these routes are difficult to fully determine and comprehend. Mitigation efforts will likely be inadequate and certainly insufficient. The City anticipates that these concerns will be considered as part of the final route selection.

The City of Corcoran expects a thorough review of its comments. Furthermore, the City requests that appropriate responses to these comments be included in the final EIR.

Respectfully,

  
Kindon Meik  
City Manager

CITY OFFICES:

832 Whitley Avenue • Corcoran, CA 93212 • Phone 559/992-2151 • [www.cityofcorcoran.com](http://www.cityofcorcoran.com)

RESOLUTION NO. 2653

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CORCORAN APPROVING COMMENTS PREPARED IN RESPONSE TO THE CALIFORNIA HIGH SPEED TRAIN REVISED DRAFT ENVIRONMENTAL IMPACT REPORT (EIR)/SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS).**

**WHEREAS**, the City Council of the City of Corcoran opposes the California High Speed Train project and the proposed routes through the City or within the City's sphere of influence; and,

**WHEREAS**, over the last year, the City has publicly reiterated that stance as outlined:

- Letter addressed to the High Speed Rail Authority dated September 20, 2011
- Resolution No. 2594 adopted by the City Council on October 3, 2011
- Public comment at the HSRA Board meeting in Sacramento on April 25, 2012
- Public comment at the Kings County Board of Supervisors meeting on May 8, 2012
- Public comment at the Kings County Board of Supervisors meeting on June 12, 2012
- Public comment at the HSRA public hearing in Hanford on August 28, 2012
- Resolution No. 2651 adopted by the City Council on September 4, 2012; and,

**WHEREAS**, the Revised Draft EIR/Supplemental Draft EIS has been provided to the City for review and public comment; and,

**WHEREAS**, the City Council has solicited the input of residents of the community during scheduled council meetings and other public forums.

**NOW, THEREFORE BE IT RESOLVED** that the City Council hereby approves the attached comments provided as follows:

- Exhibit A – Corcoran Bypass Alternative
- Exhibit B – Corcoran Eastside (Elevated) Alternative
- Exhibit C – Corcoran Westside Alternative

**BE IT FURTHER RESOLVED** that the City Council authorizes the submittal of the aforementioned comments and a copy of this resolution to the California High Speed Rail Authority prior to the October 19, 2012 deadline.

**PASSED AND ADOPTED** at the regular meeting of the City Council of the City of Corcoran held on the 15th day of October, 2012, by the following vote:

**AYES:** Councilmembers: Baltierra, Palmerin, Robertson, Wadsworth, and Lerma

**NOES:** None

**ABSENT:** None

**ABSTAIN:** None

Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

APPROVED:   
Raymond M. Lerma, Mayor

ATTEST:   
Lorraine P. Lopez, City Clerk

CLERKS CERTIFICATE

City of Corcoran        }  
County of Kings        } ss.  
State of California    }

I, Lorraine P. Lopez, hereby certify that the foregoing is a full, true and correct copy of a resolution passed and adopted by the City Council of the City of Corcoran at a regular meeting held on the 15th day of October, 2012, by the vote as set forth therein.

DATED: October 15, 2012

ATTEST:

  
Lorraine P. Lopez, City Clerk

[ seal ]

**EXHIBIT A**

**High Speed Train – Corcoran Bypass Alternative**

**Summary**

Environmental impacts associated with the Corcoran Bypass Alternative are most noticeable in the City's sphere of influence. Of particular concern is the proximity of the route to the City's water treatment/distribution facility, the potential loss of agricultural land and related jobs, and the impact on residential neighborhoods outside of the city limits.

**City of Corcoran Water Treatment Plant**

- L006-1 | 1. Bypass route is within 500 feet of the City's water treatment plant and water storage tanks. The City requests that the final EIR address the impacts of vibration on the plant, wells, and water storage tanks both during construction and once the route is operational and in use by a high speed train.
- L006-2 | 2. The route separates the water treatment facility from water storage tanks thus limiting accessibility and imposing undue constraints on the overall water treatment and distribution services of the City. Final EIR should analyze these concerns and discuss potential mitigation. EIR should address construction and operational phases of the project in regards to this item.
- L006-3 | 3. Proposed bypass route creates an overcrossing connecting Orange Avenue and Waukena Avenue. Proposed overcrossing dissects City owned land that is currently leased for 30 year period for the development of a solar project scheduled for construction in 2014. Revenues from the lease offset operation costs of the water treatment facility. Identify how the City will be compensated for lost revenues and any legal action that may occur as a result of a breach of contract.
- L006-4 | 4. Proposed Orange Avenue/Waukena Avenue overcrossing and associated roadway alignments impact City well. EIR must address impacts and potential relocation of the well.
- L006-5 | 5. Proposed Orange Avenue/Waukena Avenue overcrossing should be lighted and be accessible to bikes and pedestrians and conform to ADA codes.
- L006-6 | 6. City requests that future engineering studies and final EIR consider a frontage road from the Orange Avenue and Waukena Avenue overcrossing providing access to the City's water storage tanks.

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Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

		L006-13	The City requests that these objectives and policies be addressed in the final EIR.
	<b>Aesthetics and Noise</b>		
L006-7	1. EIR analyzes the impacts of an electric powered train. Will diesel engines be used at any time on the proposed route? If diesel engines will or even might be used on the tracks, then it's our contention that all of the impacts that have been considered in the DEIR in respect to the electricity powered trains also be analyzed in respect to the use of diesel powered trains including but not limited to the noise impacts of diesel powered engines?	L006-14	
L006-8	2. The City of Corcoran requests that decorative masonry, subject to the approval of the City, be used in the construction of sound barrier walls. EIR must identify impacts of graffiti and other aspects of blight along with ways to mitigate those impacts..	L006-15	
L006-9			
L006-10	3. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to noise: <ul style="list-style-type: none"> <li>Objective A – To protect the citizens of the City from the harmful and annoying effects of exposure to excessive noise.</li> <li>Objective C – to preserve the tranquility of residential areas by preventing noise producing uses from encroaching upon existing or planned noise-sensitive uses.</li> <li>Policy 3.3 – Industrial, commercial or other noise generating land uses should be discouraged if resulting noise levels will exceed 65 dB Ldn (or CNEL) at the boundary areas of planned or zoned noise sensitive land uses.</li> </ul> The City requests that these objectives and policies be addressed in the final EIR.	L006-16 L006-17 L006-18	
	<b>Agriculture and Agribusiness</b>		
L006-11	1. Bypass route impacts prime agricultural land and large-scale farming operations. EIR states Corcoran Bypass Alternative would result in a "greater loss in agricultural sales" and "conversion of more agricultural land to nonagricultural uses" (page S-26). Final EIR must evaluate potential loss of jobs, loss of sales tax to the City, and permitting issues.		
L006-12	2. Route proposes a realignment of the Sweet Canal. Final EIR should address water flow, capacity and access to water during the canal realignment. EIR should address short term and long term impacts to farmland and potential impacts to businesses and individuals with water rights.	L006-19	
L006-13	3. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to open space: <ul style="list-style-type: none"> <li>Objective A – Create and preserve an open space system in the Corcoran planning area.</li> <li>Policy 5.19 – The City will preserve and protect agricultural use on lands in and surrounding the Corcoran planning area for open space purposes and for the managed production of resources.</li> </ul>	L006-20 L006-21	
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**Circulation and Transit**

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|---------|--|
| L006-14 | 1. Proposed route identifies the closure of 5 ½ Avenue north of Niles and the closure of Niles Avenue east of 5 ½ Avenue. What impact will this have on emergency services and response times particularly on residents living north of the HSR route during construction and once the route is operational? |
| L006-15 | 2. The bypass route creates a new overpass or overcrossing on Whitley Avenue (State Route 137) east of Highway 43. It is necessary for the EIR to discuss how this overpass will simultaneously accommodate vehicles and farm equipment.   |
| L006-16 | 3. Caltrans has proposed a roundabout at Whitley Avenue and Highway 43. Final EIR should address the proposed project.   |
| L006-17 | 4. The bypass route creates a new Highway 43 overpass. The EIR should discuss how this overpass will simultaneously accommodate vehicles and farm equipment  |
| L006-18 | 5. Corcoran typically experiences denser fog than other central valley communities during the winter. What impacts will construction of the route and new roadways have on circulation during the foggy season?  |

**Residential and Housing Impacts**

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|---------|---|
| L006-19 | 1. Bypass route and proposed roadway alignments impact residential units owned and/or occupied by underserved residents including seniors, minorities, and lower income families.   |
| L006-20 | 2. Route dissects approved tentative subdivision (Moonlight Development along Highway 43, north of Niles Avenue and north of Newark Avenue) thus affecting preliminary engineering, design, and potential build out. The proposed housing project is situated on land recently annexed into city limits. Bypass route creates land-locked parcels. EIR should identify impacts on this housing project and maintenance of excess land owned by HSRA must be evaluated in EIR. |
| L006-21 | 3. City of Corcoran requests that Final EIR reconsider and re-evaluate availability and price of housing stock.   |

**Miscellaneous**

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|---------|---|
| L006-21 | 1. What impact will the High Speed Train project have on the Creighton Ranch Nature Preserve? |
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Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

- L006-22 | 2. How will property owners be compensated if amount owed on property is higher than appraised value?
- L006-23 | 3. Section 2.2.8.1 (page 2-14) identifies a "refuge track" for "temporary storage of work trains" and "maintenance" in the vicinity of Corcoran. Final EIR should identify site and potential impacts.
- L006-24 | 4. In Section 3.12.4.1 (page 3.12-21) the numbers used in the total population count include the inmate population at the two prisons. Most of the impacts discussed in the EIR will affect non-incarcerated population. Final EIR should address this item.
- L006-25 | 5. Residents have expressed concern regarding disrupted city services (water, sewer) during construction of the route. What efforts will be made to mitigate disrupted services?

**EXHIBIT B**

**High Speed Train – Corcoran Eastside (Elevated) Alternative**

**Summary**

As outlined in the DEIR, the Corcoran Eastside Alternative will create severe environmental impacts. These impacts will be long-term, destructive, and difficult to adequately mitigate.

Foremost on the list is the impact of noise caused by the high speed train on an elevated track especially when considered in conjunction with already existing noise impacts caused by freight and passenger rail services currently in operation. Mitigation efforts will not eliminate noise and do not fully address variables such as frequency of disturbance and levels of annoyance to noise receptors in local schools, parks, government buildings, businesses, and residential neighborhoods. Furthermore, mitigation efforts cannot account for collateral impacts that include progressively diminishing property values, loss of community character, and an overall yet unquantifiable reduction in the quality of life of Corcoran residents.

In addition to noise impacts, it is anticipated that the elevated route will disrupt or destroy Amtrak and local bus transit services in Corcoran. Corcoran residents rely on passenger rail and the dial-a-ride bus system to access employment opportunities, educational facilities, medical providers and other local and regional services. A reduction or loss of passenger rail and local bus routes would primarily affect seniors, the disabled, low-income households, minorities and other underserved residents.

Finally, the eastside alternative will create ongoing planning and land use issues that will be unfavorable to the community. Noteworthy is the probable blight caused by the elevated route within and adjacent to the right of way of the train viaduct. Of equal concern is the way in which the elevated track dissects the community and the potential to force future growth in an unintended direction and towards existing flood plains.

**Aesthetics and Noise**

1. EIR analyzes the impacts of an electric powered train. Will diesel engines be used at any time on the proposed route? If diesel engines will or even might be used on the tracks, then it is our contention that all of the impacts that have been considered in the DEIR in respect to the electricity powered trains also be analyzed in respect to the use of diesel powered trains including but not limited to the noise impacts of diesel powered engines?

Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

L006-27	2. Sound barrier walls must be constructed along the route through the entire north-south corridor within the city limits. The City of Corcoran requests that decorative masonry, subject to the approval of the City, be used in the construction of sound barrier walls.	L006-35	<ul style="list-style-type: none"> <li>Objective A – Create and preserve an open space system in the Corcoran planning area.</li> <li>Policy 5.19 – The City will preserve and protect agricultural use on lands in and surrounding the Corcoran planning area for open space purposes and for the managed production of resources.</li> </ul> <p>The City requests that these objectives and policies be addressed in the final EIR.</p>
L006-28	3. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to noise: <ul style="list-style-type: none"> <li>Objective A – To protect the citizens of the City from the harmful and annoying effects of exposure to excessive noise.</li> <li>Objective C – to preserve the tranquility of residential areas by preventing noise producing uses from encroaching upon existing or planned noise-sensitive uses.</li> <li>Policy 3.3 – Industrial, commercial or other noise generating land uses should be discouraged if resulting noise levels will exceed 65 dB Ldn (or CNEL) at the boundary areas of planned or zoned noise sensitive land uses.</li> </ul> <p>The City requests that these objectives and policies be addressed in the final EIR.</p>	L006-36	<p><b>Circulation and Transit</b></p> <ol style="list-style-type: none"> <li>The eastside route will threaten Amtrak services. The City of Corcoran sells an average of 1,000 single ride tickets per month. Amtrak reports an average of 27,000 arrivals/departures at the Corcoran station per fiscal year. Residents rely on Amtrak for: <ul style="list-style-type: none"> <li>Employment opportunities</li> <li>Educational endeavors</li> <li>Medical services</li> <li>Civic/government services</li> <li>Connectivity to destinations outside of the community</li> </ul> <p>EIR must address the loss or reduction of Amtrak services in Corcoran.</p> </li> </ol>
L006-29	4. EIR identifies elevated route has having the most severe and significant noise impacts to the community. EIR looks at noise impact in terms of decibels but does not fully account for other variables including but not limited to the rate of recurrence, startled effect, interruptions, annoyance and disturbance. Included as comments in Exhibit D are two articles relating to sound and noise impacts.	L006-37	<ol style="list-style-type: none"> <li>Loss of Amtrak would significantly reduce transit fare box ratios and force the City to cease operating its local bus services. The City currently operates four (4) buses with an average monthly ridership of 2,800 passengers. During the 2011-2012 fiscal year, 33,580 passengers rode the City's buses. The City employs six full-time employees to operate the transit division. EIR must address and mitigate the loss of bus services in the community including loss of local jobs associated with transit services.</li> </ol>
L006-30	5. Residents have expressed concern that noise impacts will be a factor in contributing to a reduction in property values. Please address in final EIR.	L006-38	<ol style="list-style-type: none"> <li>Section 3.2.5.3 (page 3.2-71) of the EIR indicates a relocation of the Corcoran Amtrak Station. In addition to Amtrak, the station serves as the Corcoran transit depot for local bus services. The transit center, including its extensive parking lot, was designed to accommodate multiple buses and serves as a local and regional intermodal transit hub. Furthermore, the transit center was located in close proximity to the downtown corridor and pedestrian access. It is expected that final EIR will identify sites for the relocation of the Amtrak station as well as the City's transit depot. EIR should address impacts of relocation of the transit center.</li> </ol>
L006-31	6. The City of Corcoran requests a decorative, lighted sign, subject to the input and approval of the City, marking the entrance to the downtown district as part of the route overpass on Whitley Avenue.	L006-39	<ol style="list-style-type: none"> <li>Proposed route identifies a realignment of Santa Fe Avenue. What impact will this have on circulation during the construction period? What impact will the realignment have on emergency services and response times particularly during construction?</li> </ol>
L006-32	7. The elevated route will likely cause blighted areas underneath the track within the rail right-of-way. What action will be taken to mitigate potential blight? EIR should address likely graffiti on columns and other structures associated with the high speed train.	L006-40	<ol style="list-style-type: none"> <li>The elevated route creates a new overpass at Avenue 144. It is necessary for the EIR to discuss how this overpass will simultaneously accommodate vehicles and farm equipment. What impact will the overcrossing at Avenue 144 have on in town traffic during construction and after the overpass is completed?</li> </ol>
L006-33	<b>Agriculture and Agribusiness</b> 1. Eastside route impacts prime agricultural land and large-scale farming operations. Final EIR must evaluate potential loss of jobs, loss of sales tax to the City, and permitting issues.	L006-41	
L006-34	2. Route proposes a realignment of the Sweet Canal. Final EIR should address water flow, capacity and access to water during the canal realignment. EIR should address short term and long term impacts to farmland and potential impacts to businesses and individuals with water rights.		
L006-35	3. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to open space:		

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- L006-42 | 6. Corcoran typically experiences denser fog than other central valley communities during the winter. What impacts will construction of the route and new roadways have on circulation during the foggy season?
- L006-43 | 7. Elevated route proposes the closure of the Santa Fe exit at Highway 43 (page 3.2-75). Santa Fe exit is a primary entrance to the city. Discuss impacts of proposed closure.

**Residential and Housing Impacts**

- L006-44 | 1. Elevated eastside route and proposed roadway alignments impact residential units owned and/or occupied by underserved residents including seniors, minorities, and lower income families.
- L006-45 | 2. Corcoran residents have expressed concern about privacy issues associated with the elevated route. Identify efforts to mitigate.
3. Does DEIR consider impacts of route on Corcoran Station Apartments, a senior housing complex on Whitley Avenue and Flory Avenue? Were residents of the complex notified of the HST project?
4. City of Corcoran requests that Final EIR reconsider and re-evaluate availability and price of housing stock.

**Miscellaneous**

- L006-46 | 1. Elevated route proposes a 43 foot wide viaduct through Corcoran? It is necessary for the EIR to identify allowable uses under the viaduct.
- L006-47 | 2. What impact will the High Speed Train project have on the Creighton Ranch Nature Preserve?
- L006-48 | 3. How will property owners be compensated if amount owed on property is higher than appraised value?
- L006-49 | 4. Section 2.2.8.1 (page 2-14) identifies a "refuge track" for "temporary storage of work trains" and "maintenance" in the vicinity of Corcoran. EIR should identify site and potential impacts.
- L006-50 | 5. The elevated route dissects the community and forces future growth of the City towards the northwest and the 100 year flood plain. EIR must consider potential impacts of city growth in the flood plain.

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- L006-51 | 6. In Section 3.12.4.1 (page 3.12-21) the numbers used in the total population count include the inmate population at the two prisons. Most of the impacts discussed in the EIR will effect non-incarcerated population. Final EIR should address this item.
- L006-52 | 7. Residents have expressed concern regarding disrupted city services (water, sewer) during construction of the route. What efforts will be made to mitigate disrupted services?

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**EXHIBIT C**

**High Speed Train – Corcoran Westside Alternative**

**Summary**

Analysis of the three proposed routes indicates that the Corcoran Westside Alternative is the most detrimental to the City of Corcoran. The known impacts caused by the alignment are devastating and will be long-lasting. Probable environmental impacts, the extent of which is difficult to determine at this time, will be equally harmful to the community.

Residential neighborhoods and local businesses in Corcoran will be disproportionately subjected to the effects of the westside alignment. The realignment of Otis Avenue will displace existing businesses from Brokaw Avenue to Niles Avenue. Several business owners indicate that they will not be relocating in Corcoran if they are forced to cease operating. Businesses located in proximity to this corridor as well as those in the downtown district will also be affected by the proposed route. Business closures will subsequently result in lost sales tax revenues and a devaluation in the property tax base. The realignment of Otis Avenue will also displace disadvantaged residents of apartment complexes, a mobile home park, and single family dwellings in low-income housing units. The limited availability of affordable housing in Corcoran will make it difficult for these individuals and families to relocate.

As with the elevated route, the noise caused by the high speed train on the BNSF alignment, especially when considered in conjunction with already existing noise impacts caused by freight and passenger rail services currently in operation, will be significant. Mitigation efforts will not eliminate noise and do not fully address variables such as frequency of disturbance and levels of annoyance to noise receptors in local schools, parks, government buildings, businesses, and residential neighborhoods. Furthermore, mitigation efforts cannot account for collateral impacts that include progressively diminishing property values, loss of community character, and an overall yet unquantifiable reduction in the quality of life of Corcoran residents.

Additionally, it is anticipated that the westside route will disrupt or destroy Amtrak and local bus transit services in Corcoran. Corcoran residents rely on passenger rail and the dial-a-ride bus system to access employment opportunities, educational facilities, medical providers and other local and regional services. A reduction or loss of passenger rail and local bus routes would primarily affect seniors, the disabled, low-income households, minorities and other underserved residents.

From a land use and planning perspective, the westside alignment creates issues with traffic flow and congestion, changes traffic patterns as a result of new overpasses and interchanges, and

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increases response times for emergency services due to road closures. Also of concern is the probable blight caused by the west alignment the way in which the route dissects the community and the potential to force future growth in an unintended direction and towards existing flood plains.

**Aesthetics and Noise**

L006-53

1. EIR analyzes the impacts of an electric powered train. Will diesel engines be used at any time on the proposed route? If diesel engines will or even might be used on the tracks, then it's our contention that all of the impacts that have been considered in the DEIR in respect to the electricity powered trains also be analyzed in respect to the use of diesel powered trains including but not limited to the noise impacts of diesel powered engines?

L006-54

2. Sound barrier walls must be constructed along the route through the entire north-south corridor within the city limits. The City of Corcoran requests that decorative masonry, subject to the approval of the City, be used in the construction of sound barrier walls. EIR should address graffiti abatement and identify the agency that will be responsible for such activities. If the City of Corcoran is the responsible party, EIR must identify ongoing funding sources to cover the costs of graffiti and other forms of vandalism.

L006-55

3. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to noise:

- Objective A – To protect the citizens of the City from the harmful and annoying effects of exposure to excessive noise.
- Objective C – to preserve the tranquility of residential areas by preventing noise producing uses from encroaching upon existing or planned noise-sensitive uses.
- Policy 3.3 – Industrial, commercial or other noise generating land uses should be discouraged if resulting noise levels will exceed 65 dB Ldn (or CNEL) at the boundary areas of planned or zoned noise sensitive land uses.

The City requests that these objectives and policies be addressed in the final EIR.

L006-56

4. The City of Corcoran requests a decorative, lighted sign, subject to the input and approval of the City, marking the entrance to the downtown district as part of the route overpass on Whitley Avenue.

L006-57

5. EIR identifies noise impacts to Father Wyatt Park (page S-24) but does not identify impacts to Christmas Tree Park (corner of Whitley Avenue and Chittenden Avenue) or to park space on Otis Avenue between Whitley Avenue and Hanna Avenue. Final EIR should identify and discuss noise and visual impacts to all recreation and open space within 0.5 mile radius of route.

L006-58

6. EIR identifies elevated route has having the most severe and significant noise impacts to the community. EIR looks at noise impact in terms of decibels but does not fully account for other variables including but not limited to the rate of recurrence, startled effect,

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- L006-58 | interruptions, annoyance and disturbance. Included as comments in Exhibit D are two articles relating to sound and noise impacts.
- L006-59 | 7. Residents have expressed concern that noise impacts will be a factor in contributing to a reduction in property values. Please address in final EIR.

**Agriculture and Agribusiness**

- L006-60 | 1. Eastside route impacts prime agricultural land and large-scale farming operations. Final EIR must evaluate potential loss of jobs, loss of sales tax to the City, and permitting issues.
- L006-61 | 2. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to open space:
- Objective A – Create and preserve an open space system in the Corcoran planning area.
  - Policy 5.19 – The City will preserve and protect agricultural use on lands in and surrounding the Corcoran planning area for open space purposes and for the managed production of resources.
- The City requests that these objectives and policies be addressed in the final EIR.

**Circulation and Transit**

- L006-62 | 1. The westside route will threaten Amtrak services. The City of Corcoran sells an average of 1,000 single ride tickets per month. Amtrak reports an average of 27,000 arrivals/departures at the Corcoran station per fiscal year. Residents rely on Amtrak for:
- Employment opportunities
  - Educational endeavors
  - Medical services
  - Civic/government services
  - Connectivity to destinations outside of the community
- EIR must address the loss or reduction of Amtrak services in Corcoran.
- L006-63 | 2. Loss of Amtrak would significantly reduce transit fare box ratios and force the City to cease operating its local bus services. The City currently operates four (4) buses with an average monthly ridership of 2,800 passengers. During the 2011-2012 fiscal year, 33,580 passengers rode the City's buses. The City employs six full-time employees to operate the transit division. EIR must address and mitigate the loss of bus services in the community including loss of local jobs associated with transit services.
- L006-64 | 3. Section 3.2.5.3 (page 3.2-71) of the EIR indicates a relocation of the Corcoran Amtrak Station. In addition to Amtrak, the station serves as the Corcoran transit depot for local bus services. The transit center, including its extensive parking lot, was designed to

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- L006-64 | accommodate multiple buses and serves as a local and regional intermodal transit hub. Furthermore, the transit center was located in close proximity to the downtown corridor and pedestrian access. It is expected that final EIR will identify sites for the relocation of the Amtrak station as well as the City's transit depot. EIR should address impacts of relocation of the transit center.

- L006-65 | 4. The adopted General Plan of the City of Corcoran includes the following objectives and policies relating to circulation and transit:
- Policy 2.16 – Through streets and Collectors and Arterials should be no more than over a half-mile apart.
  - Policy 2.74 – Improve the speed and efficiency of mass transit in the City and enhance the current status of the existing rail system including connections to passenger rail.
  - Policy 2.75 – The transportation facilities are interdependent, and efforts shall be made to ensure an efficient system by coordination of local and regional efforts. The regional and local transit links must be closely related and synchronized to provide maximum efficiency and transfers.
- The City requests that these objectives and policies be addressed in the final EIR.

- L006-66 | 5. The westside route creates a new overpasses connecting Road 24 to 4<sup>th</sup> Avenue. It is necessary for the EIR to discuss how this overpass will simultaneously accommodate vehicles and farm equipment. What impact with the Road 24 and 4<sup>th</sup> Avenue overcrossing have on in town traffic?

- L006-68 | 6. Corcoran typically experiences denser fog than other central valley communities during the winter. What impacts will construction of the route and new roadways have on circulation during the foggy season?

- L006-69 | 7. Proposed route identifies multiple road realignments and closures including the closure of 5 ½ Avenue at Highway 43. What impact will this have on emergency services and response times particularly during construction? What impact will the realignment of Otis Avenue have on emergency services and response times particularly during construction?

**Local Economy**

- L006-70 | 1. Westside route and the realignment of Otis Avenue will result in the closure of businesses. City requests that final EIR provide current numbers as to the potential loss of businesses. EIR should also identify impacts to the community if affected businesses choose not to relocate. How will the High Speed Train project mitigate the loss of future sales taxes and property taxes associated with these businesses?
- L006-71 | 2. The City of Corcoran expresses its concern that the loss of businesses along the Otis Avenue corridor will result in abandoned buildings and eventual blight. What efforts will be made to mitigate blight along this corridor?

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L006-72

3. EIR addresses the loss of jobs associated with business closures and discusses that impact on the total population of the community. However, in Section 3.12.4.1 (page 3.12-21)) numbers used in the total population count include the inmate population at the two prisons. EIR must identify job loss impact on non-incarcerated population.
4. Local business owners have repeatedly expressed concern that changes to the Santa Fe exit on Highway 43 and the realignment of Otis Avenue will affect business activity in the downtown corridor especially during the construction period. How will this loss be mitigated?
5. Westside route and the Otis Avenue realignment affects City owned land for a proposed business/light industry park. What efforts will be made by the High Speed Train project to mitigate the loss of potential sales/property tax associated with the development of this property?
6. Section 3.12.3.1 (page 3.12.7) states that a reduction in temporary property and sales tax revenues will be offset by "long-term increases in the regional property and sales tax bases resulting from increased property values and new economic development through improved connectivity of the region to the rest of the state." Final EIR should qualify and quantify this statement in regards to Corcoran considering that Corcoran residents will not have greater access or connectivity to the rest of the state.

**Orange Avenue Overcrossing**

L006-73

1. The Orange Avenue alignment associated with the overpass should remain on Orange Avenue connecting to the Orange Avenue and Dairy Avenue intersection. Current alignment in the EIR shows Orange Avenue meandering south and connecting with Charles Avenue at Dairy Avenue.
2. EIR shows closure of 5 ½ Avenue south of Highway 43. The City requests that 5 ½ Avenue connect to the Orange Avenue overpass or to Santa Fe Avenue for continued access.
3. EIR proposes an extension of Letts Avenue south of Orange Avenue connecting to North Avenue. Four of the five local schools are on Letts Avenue causing considerable congestion at different times of the day. The proposed Letts extension should therefore be carried out in conjunction with a street widening project of Letts from North Avenue to Patterson Avenue. In this way, Letts could serve as an arterial street and be engineered to accommodate for increased circulation.
4. The City requests the construction of a road connecting Letts Avenue to Otis Avenue immediately south of Orange Avenue and north of the newly constructed homes.

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L006-73

5. Orange Avenue overcrossing will impact storm water retention basin at Orange Avenue and Letts Avenue. High Speed Train project must cover the costs of relocating said retention basin.
6. Orange Avenue overcrossing should accommodate both pedestrians and bicycles along with vehicular traffic. Overcrossing should be lighted. Overcrossing should conform to ADA design standards.

L006-74

7. What impact will the Orange Avenue overpass have on emergency services and response times during and after construction?

**Residential and Housing Impacts**

L006-75

1. Elevated eastside route and proposed roadway alignments impact residential units owned and/or occupied by underserved residents including seniors, minorities, and lower income families.
2. Corcoran residents have expressed concern about privacy issues associated with the overcrossings and elevated areas of the track. Identify efforts to mitigate.

L006-76

3. Realignment of Otis Avenue impacts Kings Mobile Lodge (614 Otis Avenue), a mobile home/trailer park on Otis Avenue. Section 3.12.4.2 (page 3.12-25) identifies 164 mobile home units in Corcoran. Kings Mobile Lodge accounts for almost half of these units. Property owner will be compensated. Identify process and financial compensation for the relocation of residents particularly those that do not own their own mobile home or trailer. Identify process and financial compensation for owners of mobile units that because of age can not be moved. Owners of mobile home units indicate that they were not notified of the HST project. It is recommended that the High Speed Rail Authority coordinate all activities associated with the mobile home park with the park manger and the Mobile Home Ombudsman with the California Department of Housing and Community Development. Final EIR must also account for the limited space in city's other mobile home park. Also, EIR must also consider that other mobile home park in Corcoran does not accept fifth wheel or other types of trailers. Multiple units in Kings Mobile Lodge are trailers.
4. What effect will the Otis Avenue realignment have on Kings Manor Apartments (1420 North Avenue)? Tenants in Kings Manor Apartments indicate that they were not notified of the project.
5. Does DEIR consider impacts of route on Corcoran Station Apartments, a senior housing complex on Whitley Avenue and Flory Avenue? Were residents of the complex notified of the HST project?
6. City of Corcoran requests that Final EIR reconsider and re-evaluate availability and price of housing stock.

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Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

**Miscellaneous**

- L006-77 | 1. The westside Alignment is within 200 feet of the site designated and engineered for the construction of the new police department/public safety facility on Otis Avenue. Identify potential impacts to this site and determine if the City will have to secure a new site for the facility. If the City must identify a new site, EIR should discuss compensation that would allow the City purchase a suitable property and carry out the necessary design and engineering.
- L006-78 | 2. What impact will the High Speed Train project have on the Creighton Ranch Nature Preserve?
- L006-79 | 3. Section 2.2.8.1 (page 2-14) identifies a "refuge track" for "temporary storage of work trains" and "maintenance" in the vicinity of Corcoran. EIR should identify site and potential impacts.
- L006-80 | 4. How will property owners be compensated if amount owed on property is higher than appraised value?
- L006-81 | 5. The Westside or BNSF route dissects the community and forces future growth of the City towards the northwest and the 100 year flood plain. EIR must consider potential impacts of city growth in the flood plain.
- L006-82 | 6. In Section 3.12.4.1 (page 3.12-21) the numbers used in the total population count include the inmate population at the two prisons. Most of the impacts discussed in the EIR will affect non-incarcerated population. Final EIR should address this item.
- L006-83 | 7. Residents have expressed concern regarding disrupted city services (water, sewer) during construction of the route. What efforts will be made to mitigate disrupted services?

**EXHIBIT D**

**High Speed Train – Noise Studies**

City of Corcoran  
Resolution No. 2653, Exhibit C  
Adopted 10/12/2012

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Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

COMMENTARY

Noise Measurements and Rail  
Traffic Development:  
A Swedish Case Study

Erik Skärbäck

Public involvement in the planning process is a prerequisite for democratic outcomes. Environmental issues regarding impacts of sound tend to be limited to mere exercises in noise estimation and guideline values. Such information is difficult for the layman to understand, and such a lack of understanding produces shortcomings in the democratic process. In addition to decibel calculations interpretable by experts, the sonic environment also can be described in more accessible ways. This article reports on a concrete planning case, the widening of the railway through Åkarp in southern Sweden, where the usual calculations of equivalent noise and maximum noise are undergoing critical analysis. In order to complement the noise description, a new measurement has been devised, "high noise time," which is equal to the total time per 24 hours in which trains pass through a place without stopping. The frequency and duration of the passing of trains may be a better measure of disturbance than the maximum noise peak per passage or the equivalent (average) noise level distributed over 24 hours. Film technology also has been developed as a method for recording the frequency and duration of train passage.

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This study shows how the use of decibel values, which are difficult to understand, has become an obstacle when dealing with relatively extreme noise situations. The article also compares and analyzes the evaluations of various traffic situations.

Research has shown that peace and quiet are important components for an individual's positive perception of his

or her surroundings. The World Health Organization (2001) states,

The noise problems of the past are incomparable with those plaguing the modern society: the roar of aircraft, the thunder of heavily laden lorries and the thumps and whines of industry provide a noisy background to our lives. But such noise can be not only annoying but also damaging to the health, and is increasing with economic development.

It is therefore important to ensure that future infrastructure projects will be even better planned than today's projects so that our children will not be drowned by noise, "[e]nsuring that environmental, including health, considerations are thoroughly taken into account in the development of plans and programmes" (Economic Commission for Europe, 2003).

Rail traffic has increased to previously-unseen levels in the southwestern part of Skåne County in southern Sweden (see Figure 1). Disturbance surveys are inadequate with regard to traffic quantities of high magnitude, which is why socio-medical effects may not have been taken fully into consideration.

Sweden has long used what is, by international standards, a very high threshold value for the "equivalent" (or average, over 24 hours) noise level of exposure to rail traffic: 60 decibels adjusted, or dBA. The fact that trains are infrequent at night accounts for the continuance of this decades-old "bonus" of 5 dBA that rail traffic holds over road traffic. Alternatively, Sweden has another threshold value, maximum noise level of exposure (70 dBA), which states that the impact of noise from passing trains upon human dwellings may not exceed 70 dBA.

Calculation models are used to estimate equivalent noise and maximum noise; the Swedish Parliament, Riksdagen, has decided on guideline values for each. These values are, however, non-mandatory. The Swedish Environmental Code

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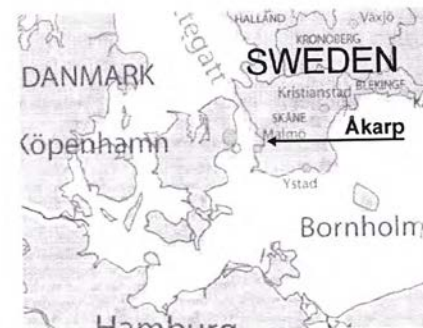


Figure 1. The study area, centering on Åkarp, southwestern Skåne County, in the south of Sweden.

provisions do not require conformity to specified levels of calculated noise. Instead, the Code mandates that environmental effects must not be damaging to health. Research dating back several decades has demonstrated a connection between the levels of average noise and perceived disturbance; the guideline values are based on this information. Subsequently, other research has shown that people also have a need for peace and silence. In a number of studies, Grahn and others have described eight different outdoor environmental characteristics that have been shown to correspond to people's fundamental needs. Four of these characteristics presume low noise, or, defined differently, a relatively high degree of silence. These characteristics are "serene," "wild," "spacious" ("to enter into another world"), and "the pleasure garden" (Grahn, Stigsdotter, and Berggren-Barrén, 2005).

The general public's participation in physical planning is a prerequisite for democratic outcomes, but sonic environmental issues tend to be limited to mere calculations of noise levels using various decibel measures. It is difficult for the public to understand what the various decibel values mean in practice, and those who fail to understand cannot participate adequately in the planning process. The affected public needs complementary descriptions of the sonic environment in terms that they can understand. This

article reports on experiences from an actual case, the planning of the railway line through Åkarp—a densely populated area between Malmö and Lund in southwestern Skåne (see Figure 1)—where the Swedish communication network funnels down to the European continent. Åkarp is surrounded by two noisy motorways (see Dufort, 2004); one railroad goes straight through the town, dividing it in two. In this case study, regular calculations of equivalent noise made by Banverket (the public authority with responsibility for the Swedish railway network) and their consultant have been complemented with estimates of "high noise time," a new measurement I devised at the request of Burlöv Municipality, the small municipality in which the town of Åkarp is situated. My definition of high noise time is the total time throughout a 24-hour period in which trains pass through without stopping, thus exposing people living close to the railroad to high noise levels. In my opinion, high noise time is easier to understand and compare across different railroads than is the equivalent noise measure, which is a mathematical average of the noise dose.

As previously indicated, Sweden has an established maximum noise guideline value of 70 dBA. If the intensity of the noise distribution is equalized at 70 dBA, then the time (that is, the duration) during which the noise continues

## Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

will become the decisive variable. What is more, the high noise duration not only indicates the duration of noise, but also its opposite, the "duration of quiet time."

From a democratic perspective, it is important that analyses regarding sound answer the questions posed by the people concerned. People do not ask for decibel values. People ask questions like, "How often or how long should I expect conversations to be broken off as a result of passing trains?" "How often will I be woken up during the night?" "Will I be allowed a half-hour or a one-hour peaceful walk in the evening after a stressful day at work?" "Will I be able to have, in my immediate surroundings, a 'serene,' 'wild,' or 'spacious' experience, to enter into another world, and will it be possible to experience peace in my garden?" The equivalent noise guideline values do not convey any sense of the frequency or duration of the noise events or silences.

#### The Case Study

##### Rapid Increase in Rail Traffic in the Öresund Region

Train travel in Skåne has doubled during the period 1999–2004. This represents a 15% increase in travelers each year. The total number of trains has increased by 21% over the past five years. One strategy to cope with the travel increase so far has been to fill previously half-full trains. The same period has seen a 19% increase in the number of freight trains through Åkarp.

A European Union report forecasts that, in the future, the Öresund Region in southern Sweden will become one of three logistics centers in Europe. The Malmö Harbor area is expected to double its current size, from 1.5 to a million m<sup>2</sup>, when the excavation residues from construction of the City Tunnel through Malmö are used to fill the low water area adjacent to the present harbor. Preliminary planning is underway to build a Freight Train Bypass Line around the Lund and Malmö urban areas; however, substantial quantities of freight must be transported into the Malmö International Railway Station. Such freight must pass through the municipality of Burlöv twice, once going into Malmö, and again going out.

##### Banverket's Focus and Responses

At an early stage, Burlöv Municipality pointed out to Banverket that the development of Malmö into a logistics

center for Northern Europe would lead to a massive increase in the freight train flow, in addition to the substantial increase in passenger trains caused by development of the Öresund Region. Banverket responded to this forecast with a confusing display of noise calculations and statements concerning disturbances varying in relation to different equivalent noise values (Banverket, 2004). In the Environmental Impact Report, an increase of 30 to 40 freight trains through Åkarp (from 70–80 to 100–120) was forecast to increase the 24-hour equivalent level by 1 dBA. This may be correct, because 3 dBA corresponds to a doubling of the noise level. What was bewildering, however, was that the consultant called this 1 dBA increase an "extremely marginal change in impact." The noise consultant furthermore stated that a potential subsequent twofold increase, from 120 to 240 freight trains, would entail a 2 dBA increase in the 24-hour equivalent noise level, which was described as a "barely audible change." Burlöv Municipality found this estimate most surprising, given that 240 freight trains is a very large number.

In an attempt to appease the municipality, Banverket offered them sound protection banks and walls similar to those that had been erected in Kallhall, outside Stockholm. When the municipality inspected the Kallhall traffic situation more closely, they found that only three freight trains pass through there per week, as compared to Burlöv's 79 freight trains per 24 hours.

##### Burlöv Municipality Requires More Understandable Data

This discovery caused Burlöv Municipality to call for their own reasonability assessment of the extent of the traffic and ensuing noise. My role was to carry out a comparison with existing traffic situations elsewhere. From Banverket's own systems department, traffic statistics were collected for locations boasting the heaviest Swedish rail traffic, and data also were collected from the Danish National Rail Administration (Banestyrelsen) concerning Tårnby, located between the Öresund Bridge and Copenhagen (the railway was transformed into a tunnel line through Tårnby in connection with the construction of the Öresund Bridge). Traffic figures were subdivided into three categories: freight trains, non-stop passenger trains, and stopping passenger trains (see Table 1).

The passage of freight trains and that of non-stop passenger trains is perceived as a high noise experience, as opposed to the very low noise of stopping trains. The duration of "high noise" from non-stop passenger trains was esti-

Table 1. Number of trains per 24 hours (based on a weekly average) through stations with heavy traffic loads in Sweden and Denmark, based on statistics from Swedish Banverket and Danish Banestyrelsen, autumn 2004

Station	Freight trains	Non-stop passenger trains, express trains or other trains that do not stop	Stopping trains: commuter trains, "plåtgång," Öresund trains, or fast trains that stop	Total number of trains
Kallhall (newly rebuilt)	0.5	5.5	13.5	188
Häggvik (4-track to Märsta)	11	269	141	421
Stockholm City	23	10*	751	784
Stockholm South	23	150	283	456
Tårnby near Kastarp (tunnel)	16	24	126	166
Frövi-Hallsberg	48	9	67	124
Lerum	42	75	75	192
Åkarp	69	183	83	335

\*All fast trains stop at Stockholm City. Only a small number of work trains pass through without stopping. The number 10 is assumed.

mated at 6 seconds, and 36 seconds from freight trains. This duration was observed empirically onsite near the railway line in Åkarp. The total duration of all the trains was calculated per 24 hours. The current high noise time periods thus calculated are illustrated in Table 2, whose statistics are also shown as a bar graph in Figure 2.

Thus, Kallhall, the station that Banverket tried to present as the model for Burlöv to follow, has less than one-tenth the duration of high noise as compared with Åkarp. Tårnby

in Denmark, where the tunnel was built, has only one-fifth the duration of high noise. Stockholm North (Märsta Line) and Stockholm South have about half the high noise duration, as well as Sweden's so-called "freight waist," Frövi-Hallsberg, and the Gothenburg region (Lerum). Representatives have consistently described Gothenburg as the "freight gateway to the world" and Lerum's heavy noise load has been well attested to and scientifically explored by environmental health experts (Öhrström & Barregård, 2005).

Table 2. High noise time per 24 hours for stations with heavy traffic loads (up to 100 dBA on the platform)

Station	High noise time, minutes		Total, minutes of high noise/24 hours (non-stop trains)	Total, hours of high noise/24 hours
	Freight trains (0.6 minutes/passenger)	Non-stop passenger trains (0.1 minutes/passenger)		
Kallhall	0.3	5.3	5.6	0.09
Häggvik	6.6	26.9	33.5	0.56
Stockholm City	13.8	1.0	14.8	0.25
Stockholm South	13.8	15.0	28.8	0.48
Tårnby (tunnel)	9.6	2.4	12.0	0.20
Frövi-Hallsberg	28.8	0.9	29.7	0.50
Lerum	25.2	7.5	32.7	0.55
Åkarp	41.4	18.3	59.7	1.00

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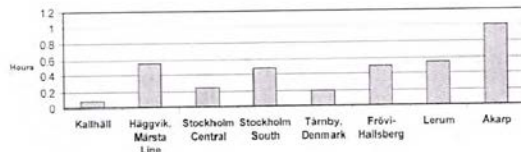


Figure 2. Hours of high noise per 24 hours for stations with heavy traffic loads.

Surprising Results

The High Noise Parameter versus Equivalent Noise

Everyone involved appeared to be surprised by the fact that the railway stations between Malmö and Lund are apparently the locations with the heaviest train noise loads in all of Sweden. This is remarkable, given that Banverket has such high-standard traffic statistics and that the state priorities for noise protection investments must in all likelihood be related to needs. This general overview of the nationwide differences, disclosed through my relatively simple high noise calculations, either did not exist at Banverket or did exist but was never divulged.

The statistics show that the assessment, "extremely marginal change in impact," in relation to a 1 dBA equivalent noise increase, must be called into question. The increase of 30–40 freight trains per 24 hours alone is more than today's total number of freight trains on several heavily-used Swedish railway lines (see Table 1, e.g., Lerum). A survey has been carried out in Lerum by the Department of Occupational and Environmental Medicine, University of Gothenburg (Öhrström & Barregård, 2005). It reports on the Lerum population's intense irritation over what

they consider disturbing train noise. At 51–55 dB<sub>eq</sub>, 37% responded "rather disturbed," "very disturbed," and "extremely disturbed" and at 56–60 dB<sub>eq</sub>, 58% made the same distinctions. That report hardly would characterize 30–40 freight trains as an "extremely marginal change in impact."

Banverket's railway report concerning the Southern Trunk Line, Håstad-Årlov route, forecasts intervals for the highest and lowest potential development by 2020 (Banverket, 2004). Assuming medium values of these intervals, the result is an increase of approximately 42%, without a Freight Train Bypass Line, in the number of trains through Åkarp by the year 2020 (up from today's 335 trains) and an increase of approximately 50% with a Freight Train Bypass Line (see Table 3). A separate review of freight traffic development in the report reveals that Banverket is counting on a mere 9% increase if the Freight Train Bypass Line is not constructed, which is considerably less than the most recent developments show. Taking into consideration the development of Malmö Harbor into a major logistics center in Northern Europe, the modest forecast appears unrealistically low. If the Freight Train Bypass Line were constructed, the Banverket 2020 forecast amounts to a 60% increase. Traffic development in the long term has been investigated by an independent consultant (Intregia, 2005). The fastest forecast alternative,

Table 3. Traffic development forecast for Åkarp in 2020, according to the Banverket railway report for the Håstad-Årlov route

	Freight trains	Passenger trains	Total
Åkarp in 2020, according to Banverket, without GTBL (Freight Train Bypass Line)	10–80 (a 9% increase from the present)	320–420	420–500 (a 42% increase from the present)
Åkarp in 2020, according to Banverket, including GTBL (Freight Train Bypass Line) alt. 1	100–120 (a 60% increase from the present)	350–430	450–570 (a 50% increase from the present)

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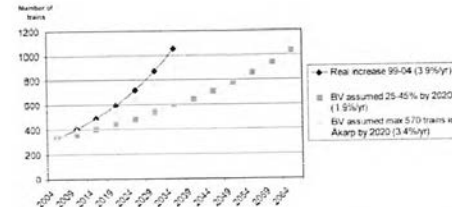


Figure 3. Traffic increase in number of trains per 24 hours in Årlov and Åkarp; BV = Banverket.

corresponding to an actual traffic increase of 3.9% from 1999–2004, implies that a 900-train scenario (approximately full capacity) will be attained as early as the 2030s; see Figure 3. If, conversely, Banverket's lowest forecast is assumed (a total traffic increase of 1.9%), the ceiling will be hit in the 2050s.

The illustration of today's high noise time situation in Figure 2 may serve as a model for a forecast of the future situation; see Figure 4. In the future, Åkarp will further surpass the rest of Sweden in terms of high noise duration. The second and third bars of Figure 4 correspond to Banverket's forecast for number of trains by 2020, as also seen in Table 3.

The fourth bar, a second alternative regarding the Freight Train Bypass Line, corresponds to a noise calculation made by Banverket concerning a case in which freight traffic is assumed to be twice that of the first alternative. In the second alternative, equivalent noise is affected by 2 decibels, an increase characterized by the Banverket noise consultant as a "barely audible change." The high noise duration, however, increases by 1 hour and 20 minutes. This increase alone is almost three times that of the total high noise duration of the other train routes with the heaviest traffic loads in Sweden; see comparisons in Figures 3 and 4. In this case, the total number of trains amounts to 590–690 trains per 24 hours. Even so, the four-track capacity is not fully taken into account.

The fifth bar indicates a further increase potential of 200–300 trains that would fill the maximum capacity, expected to be reached sometime from 2040–2060. Depending on

the combination of train types, the high noise ratio may amount to a total of four hours out of 24.

One may ask how Banverket can allow themselves to choose a forecasting period as imminent as the year 2020 when the track capacity is filled to only slightly more than half by that date. Furthermore, doing so is in violation of the Swedish Environmental Code, which now

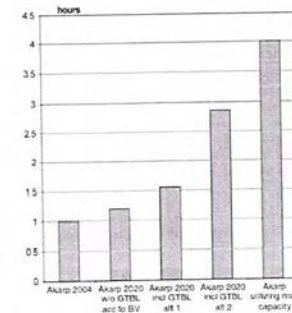


Figure 4. High noise duration in Åkarp for future cases; BV = Banverket, GTBL = Freight Train Bypass Line.

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has ruled that noise protection must be adjusted for future full-scale traffic, even if such traffic quantities lie far in the future.

### Discussion

#### Confusion Regarding Different Research Results

How, then, is it possible for the Banverket consultant to claim that an additional 30–40 freight trains is potentially an “extremely marginal change in impact” and that a further addition of 120 freight trains amounts to a “barely audible change”? Professor Tor Kihlman (2005) declares this to be a clear error, a confusion of audiometric tests and equivalent noise calculations.

Equivalent sound intensity level is tested when a test subject makes a direct comparison between two sounds interchangeably presented to him or her, reporting the perceived difference between the two. In this test, a 10-decibel increase is perceived as a twofold increase and an increase of 3 decibels is required to perceive a change. Three decibels is technically a doubling of the noise energy. The curve is, thus, logarithmic. Equivalent noise, on the other hand, is the average noise during a longer period of time. If a comparison is made between a variety of cases involving alternative traffic intensities, that is, different frequencies and lengths of trains, and the point of departure is that the fleet of train cars produce equivalent amounts of noise in the various cases, then the disturbance dose is proportional to the combined duration of the noise from the trains passing by.

#### The Need for New Dose/Response Investigations

According to Kihlman, new dose/response investigations are necessary to enable calculations of disturbances regarding the substantial traffic quantities occurring between Lund and Malmö, because train traffic of such a magnitude has not been experienced there before. Occupational and environmental health experts are so far unable to express any opinions concerning the effects on public health, as is stipulated in the Swedish Environmental Code.

It seems self-evident that a response would be logarithmic in correspondence with the equivalent sound intensity level test; that is, at already increased noise levels, it takes an ever higher noise increase to be discernible as an increase in noise. Instead, the opposite may apply with re-

gard to equivalent noise from trains; that is, the more often and longer we are interrupted in our conversations by passing trains, the less tolerant we are about accepting yet another train. We may accept being woken up by trains twice a night, but the third occasion may become the straw that breaks the camel's back. In a Berlin study, Babisch et al. (2005) showed a remarkable 30% increased risk of myocardial infarction in men exposed to >70 dBA (6–22 hours). If the duration of exposure at the same level, >70 dBA, lasted more than 10 years, the risk increased to 80%. At a noise level of 60–65 dBA, the increased risk after 10 years' exposure was 40%. These results reveal that there may be no such thing as adaptation to noise. On the contrary, research in the fields of occupational and environmental health indicates that one can endure only a certain “life dose” of high stress, and because high traffic noise produces unwanted stress, organisms can accommodate only a limited life dose of high noise.

#### The Equivalent Noise Guideline Value Needs to Be Adjusted

Our study of high noise duration also revealed that Sweden has an unreasonably high guideline value for equivalent noise. Although the Malmö-Lund route, as compared with the other most heavily trafficked railway routes in Sweden (Gothenburg, Stockholm, the Frövå-Hallsberg stretch) has twice as much, or more, average noise counted as high noise duration, it is the maximum noise value and not the equivalent noise value that is used as the dimensioning factor for the noise protection investments in Åkarp (at least with a calculated traffic increase up to 2020, the forecasting period in the Banverket railway report). Unless equivalent noise is accepted as the dimensioning factor in Åkarp, it may not be used in any other planning situation in Sweden either, because the high noise level is less persistent in other places. This confirms that our equivalent noise guideline value has been set at a very high level and is unparalleled, insofar as it never will be enforced.

The equivalent guideline values applying in Germany are 54 dBA daytime value (6 am to 10 pm) and 49 dBA at night (10 pm to 6 am) in housing areas, and, for places such as schools and daycare centers, there is a 52 dBA daytime value. Looking at this comparison, there may be cause to recall the joint statement by the Swedish and Danish prime ministers, who said that “the Öresund region will be among the most environmentally friendly regions in Europe.” If that goal is to be reached, the equivalent noise guideline value must be lowered considerably.

#### Films with Analytical as well as Instructive Impacts

A problem with showing the equivalent noise measure as an average value is that it does not describe how rail traffic produces short sequences of high noise and intervening periods without train noise. The equivalent measure in relation to road traffic noise is slightly more intelligible, because road traffic is more evenly distributed over time. Consequently, comparisons of decibel values for road traffic and rail traffic are difficult. One way of bridging the gap in knowledge is to show the instantaneous noise on film, for example, railway noise can be depicted as foreground noise bubbles moving across a plan map, while road traffic noise is shown as a background image, an integral part of the map.

This is what John Wadbro (2005) has done in a film of Åkarp. His aim is to make road, as well as rail, traffic noise intelligible and comparable in the same film sequence. Four different films have been produced for different noise protection measures: (1) The ground alternative with walls 2 meters high, (2) embedded 1.5 meters plus walls, (3) tunnel alternative 1 km, and (4) tunnel alternative 1.6 km. Wadbro's color scale for the instantaneous noise is identical for road traffic noise and train noise. Consequently, one is not left with a single option of transforming train noise into equivalent noise in order to compare it with road traffic noise. Transforming the sound into a visual image improves our capacity to make the comparisons. To interpret the film, it is important to note that it does not primarily display the dose, that is, the average noise per time unit; however, such a display should be possible in a further developed version. The dose/response investigations originate from the premise that it is the combined dose over a certain period of time that is correlated to the response/health impact. Can one be certain, however, that the dose measure has the highest correlation with disturbance? Perhaps disturbance is also a function of the frequency of peaks in train noise, or the duration/length of trains, or the distribution between maximum noise and silence. Further studies are required in this area.

#### Not Only Regulations, but also Local Considerations

It also must be noted that “guideline values are not legally binding, but must serve as guidance when local factors and special circumstances in each individual case are taken into consideration” (Sahlin, 2005). This article primarily discusses calculation measurements and guideline values, but

also deals with special circumstances, such as the need for serene places in one's surroundings. The sonic environment should not only focus on regulating the level of noise exposure, but also on developing quiet places and areas. Recent research has shown that among several environmental characteristics, serenity is key to basic human needs (Gjahn, Stigsdotter, and Bejrgren-Bärning, 2003); however, serenity has not yet become a factor on par with other indicators of a sustainable society.

### Conclusion

The Åkarp case study reveals that the duration of high noise from the railway line between Lund and Malmö, including Åkarp, is double that of other stretches of railway in Sweden. This implies that the maximum noise level of exposure has so far been the dimensioning factor for every other railway project in Sweden. From this it follows that traffic intensity has never weighed heavily into Banverket's calculations concerning noise protection; instead, Banverket has decided upon the same requirements for noise protection nationwide, regardless of the number and length of trains. Ten trains producing an X decibel noise level have resulted in demands for the same noise protection as 600 trains producing a noise maximum of X decibels. If the level of maximum noise exposure is equalized at 70 dBA, then the total exposure time to the noise of passing trains over a 24-hour period will be a determining parameter for comparisons between rail traffic noise in different cities. Thus, comparing the duration of high noise exposure is relevant and far easier to understand than is the comparing of equivalent noise values; therefore it is more appropriate from a democratic perspective.

The case study also exemplifies how the difficulty in assessing long-term traffic development has led Banverket to choose a somewhat short-term forecast period with a relatively moderate traffic development and, therefore, to suggest relatively limited noise protection. Judgments passed in Swedish Environmental Code cases have ordained, however, that traffic installation noise protection must be based on full use of the installation, irrespective of the time it takes for full use to appear. The study concludes, among other things, that the “bonus” of 5 dBA is not relevant today, because some rail sections in urban areas show high frequency use at night.

Recent research shows a significant increase in myocardial infarction associated with long-term high noise exposure (Babisch et al., 2005). Examples of “local factors and special

Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

circumstances" that must be taken into consideration are overlapping noises from other sources, such as near by motorways, as well as local climatic phenomena—for example, ground inversion that may sometimes cause exceptional sound amplification. The value of public access to quiet and peaceful places, where inhabitants can satisfy their needs for relaxation, for hearing natural sounds, and the like, is also elucidated by the case study.

Public involvement in planning is critical to democratic outcomes. People must understand the technical issues (in this case, analysis of sound) if they are to participate in shaping public policy. This is only possible when the issues are presented in terms that make sense to the layperson. I have tried to show the kinds of questions for which the public requires answers, if they are to understand issues surrounding sound levels. The use of equivalent noise for rail traffic estimations is a special point of democratic weakness in the planning process. Using the more informative, accessible high noise parameter is a complementary option. I also have demonstrated how the film medium can be useful in illustrating comparisons between road and train traffic noise and in making alternative solutions for future rail traffic situations more intelligible.

#### Notes

1. Decibels adjusted (dBA), also called "A-weighted decibels" refers to the expression of the relative loudness of sounds in air as perceived by the human ear.
2. dBA<sub>eq</sub> refers to equivalent sound level per 24 hours please also see L. Ohlström, A. Skoldberg, L. Barregård, H. Svansson, and P. Årge, 2009, "Effects of Simultaneous Exposure to Noise from Road and Railway Traffic," *Internoise 2009*, The 2009 International Congress and Exposition on Noise Control Engineering, Rio de Janeiro, Brazil, August 7-9th.

#### References

- Babisch, W., B. Beule, M. Schott, N. Kersten, and H. Ising. 2008. Traffic Noise and Risk of Myocardial Infarction. *Epidemiology* 19(1):33-40.
- Banverket. 2004. *Säkra Standarder [Southern Train Line], Håstad-Arås, MKB [EIR]*, 2004-09-14, Banverket, Borlänge, Sweden.
- Dufort, L.B. 2004. *The Noise in Åkarp, Large Project Utsäff, Department of Landscape Planning, Swedish University of Agricultural Sciences, Åkarp, Sweden*. <http://kurssu.se/kurser/LP0398/0086.0405/landbesitt/DUFORT.pdf>.
- Economic Commission for Europe. 2003. *Protocol on Strategic Environmental Assessment of the United Nations and Economic Commission for Europe*. ECE/MPEIA/2003/5, Article 14.
- Grahn, P., U. Sigurdsson, and A.-M. Berggren-Barron. 2009. A Planning Tool for Designing Sustainable and Healthy Cities: The Importance of Experienced Characteristics in Urban Green Open Spaces for People's Health and Well-Being. In conference proceedings, *Quality and Significance of Green Urban Areas*, Van Hall-Larenstein University of Professional Education, Velp, The Netherlands, April 14-15.
- Intergia. 2005. *Samhällets utveckling och Transportsystem i Malmö-Landskrona (Urban and Transport Development of the Malmö-Lund Area)*. Intergia, Sweden.
- Kühnman, T. 2009. *Bete Tidguller i Åkarp (About Train Noise in Åkarp)*, 2009-09-17, Göteborg, Sweden.
- Ohlström, L., and L. Barregård. 2009. *Envägning Health Effects Related to Noise from Roads, Trains and Aircraft in the Municipality of Lerum (Undersökning av Hälsoeffekter av Buller från Vägtrafik, Flyg och Flyg i Lerums Kommun)*. ISSN 1400-9604, Göteborg University, Sweden.
- Sahlén, M. 2009. *Skrivning till Riksdagen (Memorandum to the Swedish Parliament)*. M2009/046/00, Ministry of City Planning, Stockholm, Sweden.
- Wadbro, L. 2009. Student assignment for the course, "Stora Projekt" Department of Landscape Planning, Swedish University of Agricultural Sciences, Åkarp, Sweden. [http://www.buio.se/kommunikation/service/bygg\\_anlaggningstors/storade\\_858/bulletin/bulletin.htm](http://www.buio.se/kommunikation/service/bygg_anlaggningstors/storade_858/bulletin/bulletin.htm).
- World Health Organization. 2009. *Occupational and Community Noise*. Fact Sheet 258, World Health Organization, Geneva, Switzerland.

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Physics, Physiology and Psychology of Loudness

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## Physics, Physiology and Psychology

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When we complain about intrusive noise, sooner or later we encounter the word decibel. Typically what happens is that some official comes along and mumbles something about decibels and then explains to the authorities that the noise we are complaining about isn't really all that loud at all. He will say something about logarithms, which municipal council members don't understand at all but will be impressed by the long words, and your complaint is dismissed.

I have suffered through this process, and I have had to listen to a professional acoustical engineer spouting jargon to a municipal council, and the council swallowing everything he says. What makes it all the more annoying for me is that I am by profession a research physicist and I have had to sit through technical evidence that is to me manifest scientific nonsense.

One apparently common misconception (deliberate or otherwise I know not), is that an increase of 10 decibels corresponds to only a doubling of perceived loudness. I have heard an engineer give evidence to this effect to a municipal council, and it is repeated, quite erroneously, in the Harvard Medical School Health Letter article "Noise Pollution: Irritant or Hazard" which has been distributed by our own Society. I have from time to time had occasion to teach physics to medical students, and I can tell you that it is a rather discouraging experience! The problem with this particular myth is that we are told that the "perceived loudness" of, say 60 decibels is not all that much louder than, say, 55 decibels. We need to put this straight.

Another problem is that we are often told that 55 dB is about the level of normal conversation and is therefore nothing to complain about. Again, we need to put this straight.

This article will be technical where need be, and I shall not avoid equations when necessary. Not everyone will understand the more technical and mathematical bits. But I feel that it is very important to put it on record correctly and in a manner that can be understood at a scientific level. To avoid this would mean trying to argue scientific matters by polemics rather than by reason. In any case I am sure that most members will follow most of the article and are capable of skipping over the mathematical bits.

The problem of how loud a sound is, or is perceived to be, or how annoying it is, can be discussed from the points of view of physics, or of physiology, or of psychology. I am going to take each of these in turn. Of these, believe it or not, it is physics that is easiest! In physics it is possible to specify and measure a sound level with great precision, and the decibel scale has its basis in good physics. Sound is a form of energy, and energy is expressed in a very precise unit called the joule. The sound intensity arriving at your dwelling can be very

## Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

Physics, Physiology and Psychology of Loudness

precisely measured in terms of the rate of arrival of energy across unit area, and is expressed in joules per second per square metre. There is nothing at all subjective about it. Nor does it depend on the frequency of the sound wave.

The decibel scale is used to express the ratio of a particular sound intensity to some standard, usually taken to be an intensity of  $1 \times 10^{-12}$  joules per second per square metre. (Sorry for the technicality there, but we must put it on record in precise terms.) The scale is such that if one sound has TEN times (NOT twice!) the intensity of another, the difference in sound levels is said ten decibels, or 10 dB. Those familiar with logarithms will understand (and those unfamiliar will be mystified!) that a factor of two in sound intensity corresponds to a difference of THREE (NOT ten!) decibels.

In summary: 53 dB is twice the sound intensity of 50 dB, 60 dB is ten times the sound intensity of 50 dB.

And do not let anyone tell you otherwise!!!!

We now move on to a science a little less precise than physics, namely physiology. The ear is not equally sensitive to all frequencies, and entirely insensitive to very high and very low frequencies. The frequency response of the ear varies from individual to individual, and especially it varies with age, and it also varies with the intensity of the sound. The relative sensitivity of the ear to different frequencies can be measured (somewhat subjectively) by asking an individual to compare two sounds of different frequencies, and by varying the intensity of one sound until the subject judges them to be equally loud. Thus we can measure something that might be called "perceived loudness", which is not the same thing as sound intensity; it does depend on the sound intensity, but it also depends on the frequency spectrum.

In order to allow for the properties of the human ear, a "dBA" scale, or "decibels on the A scale" has been set up, in which a decibel meter is set up to imitate as closely as possible the frequency sensitivity of the human ear. This varies from human to human; however, the dBA scale is set up in reference to a "standard" human ear, whose frequency sensitivity is in fact precisely defined, even if it may not coincide exactly with your own ear. Thus the dBA scale, even though intended to imitate a sort of average human ear, is quite precisely defined in the sense that the sound intensity on the dBA scale is not a matter of opinion but it is capable of almost as precise definition and measurement as a frequency-independent scale.

I have seen no justification in any scientific literature of the common statement that "perceived loudness" doubles for every increase of ten on the dBA scale. I have seen this incorrect statement accompanied by an explanation that perceived loudness is proportional to the logarithm on the sound intensity. I first heard these assertions given in evidence to a municipal council by an engineer who was attempting to convince the council that 60 dB wasn't all that much louder than 55 dB, and that my complaints about noise were unjustified. In fact the engineer was merely displaying his ignorance of elementary logarithms at a high school level, for both statements cannot possibly be true. If it were indeed so that 10 dB results in only a two-fold increase in perceived loudness, it does not mean that perceived loudness is proportional to the logarithm of the intensity. It would mean that the perceived loudness is proportional to the intensity to the power of 0.3. This may sound very technical, but it is important to put it on record, because we who are disturbed by noise are often portrayed as ignorant and it needs an engineer to come along and make some measurements and talk about logarithms and decibels to prove that we really aren't disturbed by the noise at all!

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In fact one of the reasons that the decibel scale was first set up was to accommodate a physiological "law" known as the Weber-Fechner law, in which it was supposed that perceived loudness was proportional to the logarithm of the intensity; or, put another way, if the sound intensity increases geometrically, the perceived loudness increases arithmetically. According to this law, the perceived loudness would be linearly proportional to the decibel scale. The Weber-Fechner law is, however, only a rather approximate rule of thumb rather than a physical law, although it is fairly good over a moderate range of intensities. No very simple mathematical expression exists, for accurately describing perceived loudness over a wide range of frequencies and intensities, and there is no basis at all for the "doubling for every 10 dB". What cannot be denied, however, is that sound intensity, if not perceived loudness, increases tenfold for every 10 dB.

We have seen, then, that from the point of view of physics, the decibel scale is perfectly well defined. From the point of view of physiology, the "dBA" scale has been set up to approximate the response of the human ear. The third word in our title was psychology, and this deals with how annoying or disturbing a sound actually is. Psychology is the least amenable to quantification of the three sciences in the title. It is barely possible to set up a mathematical scale to determine how annoying a particular noise is, and indeed from this point of view the engineer's measurements of decibels and his learned if erroneous talk of logarithms is largely irrelevant. For example, it is sometimes held that normal conversation is about 58 dB and a noise at this level is therefore nothing to complain about. Indeed Saanich Municipality on this basis allows 58 decibels continuously from 9 a.m. to 10 p.m. at my property on this very basis that 58 dB is "only" normal conversation and is not harmful and it is therefore unreasonable to complain about. But try yourself to hold a conversation with someone, or to read a book or to watch television, or to study or to go to sleep when someone is unceasingly making a noise at 58 dB! Such an unwanted intrusion is utterly intolerable, and it is no answer at all to say it is "only" 58 dB and is not "harmful".

We can give many very simple and ridiculously obvious examples to show that the decibel scale gives no indication at all as to how annoying or disturbing an unwanted noise can be. We have seen above that 58 dB is twice the sound intensity of 55 dB. Does it follow that 58 dB is twice as annoying? Not a bit of it! Consider the following examples.

(1) Which is the more annoying:

- (a) 58 dB for five seconds? or
- (b) 55 dB for five hours?

(2) Which is the more annoying:

- (a) 58 dB at 3:00 p.m.? or
- (b) 55 dB at 3:00 a.m.?

(3) Which is the more annoying:

- (a) a Mozart piano sonata at 58 dB?
- (b) someone scraping his fingernails over a blackboard at 55 dB?

These absurdly simple examples demonstrate clearly that the amount of annoyance a noise causes is not to be measured by decibels or by engineers, and **we must not allow "authorities" to tell us that we are not annoyed by some noise because the decibel reading proves that we are not annoyed.**

This is an important point, because there are generally two types of municipal noise bylaw. In

Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

Physics and Acoustics and Propagation of Sound

one, it is deemed to be an offence to make a noise that causes disturbance to persons. In the other, it is deemed to be an offence to make a noise that exceeds a certain decibel level. It is often held that the latter type of bylaw is more "scientific" and more "objective" and hence more desirable. In a future article I shall argue very strongly against this viewpoint and I would warn very strongly about accepting a bylaw that sets a decibel level rather than one which prohibits disturbance.

<http://interact.uoregon.edu/MediaLit/wfae/readings/Physics.html>

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From: (559) 992-2151 Kindon Meik City of Corcoran 832 Whitley Avenue Corcoran, CA 93212	Origin ID: VISA	FedEx E	Ship Date: 18OCT12 ActWgt: 0.6 LB CNO: 95339244NET3300
SHIP TO: (916) 324-1541 Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment 770 L Street, Suite 800 SACRAMENTO, CA 95814			Delivery Address Bar Code 
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			<b>RECEIVED</b> 10/19/2012
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## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012)

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### **L006-1**

Wells currently located adjacent to the existing BNSF tracks are subject to vibration levels substantially higher than the vibration levels that would be generated by HST operations. If the wells are not currently experiencing any of these problems under existing conditions, they would not be expected to experience these problems with the addition of HST operations.

### **L006-2**

Refer to Standard Response FB-Response-PU&E-03.

Section 3.6 Public Utilities and Energy, page 3.6-37 of the Revised DEIR/Supplemental DEIS discusses permanent impacts within the project footprint. Utilities within the permanent project footprint would be either relocated outside the restricted access areas of the HST right-of-way, or they would be modified (i.e., encased in a pipe sturdy enough to withstand the weight of HST System elements) to avoid the conflict.

### **L006-3**

Refer to Standard Response FB-Response-LU-03, FB-Response-LU-04, FB-Response-SO-01.

### **L006-4**

Refer to Standard Response FB-Response-PU&E-03, FB-Response-HWR-01.

### **L006-5**

The Orange/Waukena overcrossing has been designed to retain the existing roadway section, including 8-foot shoulders, which may be used as a shared bike lane. Street lighting and pedestrian circulation needs will be determined during further stages of design through ongoing discussions and design reviews with the City; pedestrian circulation will meet Americans with Disabilities Act codes.

### **L006-6**

As shown in the Revised DEIR/Supplemental DEIS Volume 3 roadway drawings (issued July 2012), a road connecting 5th Ave to Orange (176th Ave) has been added, which provides frontage road access to the City's water storage tanks.

### **L006-7**

Refer to Standard Response FB-Response-GENERAL-13.

### **L006-8**

Refer to Standard Response FB-Response-AVR-03.

EIR/EIS Section 3.16, Aesthetics and Visual Resources, Table 3.16-2 of the Revised DEIR/Supplemental DEIS has been revised to address graffiti and blight. In addition, construction mitigation measure AVR-MM#1a has been revised such that: "Any graffiti or visual defacement of temporary fencing and walls will be painted over or removed within 5 business days." Project mitigation measures AVR-MM#2f and AVR-MM#2h have been revised such that: "Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable time after notification."

### **L006-9**

Locally preferred sound barrier treatments, as described in the comment, would be incorporated in accordance with Mitigation Measures AVR-MM#2a and #2g in Section 3.16, Aesthetics and Visual Resources, of the Revised DEIR/Supplemental DEIS. Mitigation Measure AVR-MM#2g: Provide Sound Barrier Treatments calls for use of surface coatings that facilitate cleaning and removal of graffiti.

### **L006-10**

Most Noise Elements contained in respective General Plans have similar objectives and policies. These were taken into account as part of the project.

### **L006-11**

Refer to Standard Response FB-Response-GENERAL-04, FB-Response-SO-05.

For information on the economic effects on agriculture see EIR/EIS Volume I Section 3.12 Impact SO #15. For a detailed analysis of the effects of the HST project on agricultural production, see Appendix C of the Community Impact Assessment Technical Report (Authority and FRA 2012h). The analysis in that appendix provides these results by county and by project alternative in terms of the number of acres of agricultural

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## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

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### **L006-11**

production loss, the resulting annual revenue loss in both dollar and percent terms for each type of agricultural product, and the employment loss.

For information on the HST operation-related property and sales tax revenue effects see Volume I Section 3.12 Impact SO#3, Impact SO#4, and Impact SO #12. The Authority has committed to maintaining a "permit bureau" to help businesses (including agricultural operations) overcome the regulatory disruptions caused by the project.

### **L006-12**

Refer to Standard Response FB-Response-AG-04.

As shown in Volume III of the EIR/EIS, Sweet Canal would be realigned to the east of the HST alignment where it runs roughly parallel to the HST. It would then be brought back west across the HST alignment at 4th Avenue. The canal would be placed in a pipe across the alignment. The design/build contractor would coordinate the realignment with the canal owner to minimize disruption of water supplies provided by the canal.

### **L006-13**

Refer to Standard Response FB-Response-LU-02.

These City of Corcoran policies are related to actions that the City of Corcoran would take in approving projects within its jurisdiction. Local land use plans are created by cities and counties with authority over the type and amount of land uses that can be developed in their areas. Therefore, the Authority has no authority over land use decisions in these areas.

### **L006-14**

Refer to Standard Response FB-Response-S&S-01.

### **L006-15**

Roadways in rural areas (having average daily travel [ADT] greater than 2000) are provided 8-foot shoulders consistent with the existing roadway condition. Grade separations comply with Caltrans standards for stopping sight distance.

### **L006-16**

Improvements to the State Route (SR) 43 and SR 137 (Whitley Avenue) intersection are included in the 2011 Kings County Regional Transportation Plan (RTP) (KCAG 2010), but are not funded. In the RTP, Figure 4-29, titled Candidate Projects: State Highway Operations and Protection Program Kings County, includes a project described as "Construct Round-about or Traffic Signals" at SR 43 and SR 137 (Whitley Ave). Projects described in Figure 4-29 are short-range state highway projects that are candidates for future State Highway Operation and Protection Plan programming.

The Corcoran Bypass Alternative is the only alternative that could potentially impact this intersection. However, as shown on Drawing CB1865 in Volume 3, Alignments and Other Plans, of the Final EIR/EIS, the proposed crossing of SR 137 under the Corcoran Bypass Alternative would not impact the intersection of SR 43 and SR 137. The undercrossing should be able to be incorporated into either a round-about design or traffic-signal improvement plan.

### **L006-17**

Roadways in rural areas (having average daily travel [ADT] greater than 2000) are provided 8-foot shoulders consistent with the existing roadway condition. Grade separations comply with Caltrans standards for stopping sight distance

### **L006-18**

Refer to Standard Response FB-Response-S&S-01.

### **L006-19**

Refer to Standard Response FB-Response-LU-04, FB-Response-AG-03.

Impacts on division of community, including the proposed development, are discussed in Section 3.12.8.2. Mitigation measures for this impact are discussed in Section 3.12.11.

### **L006-20**

Refer to Standard Response FB-Response-SO-01.

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## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

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### **L006-20**

The Federal Railroad Administration and Department of Transportation issued a notice of intent to prepare an environmental impact statement for the California High Speed Train Project for the Fresno to Bakersfield Section on October 1, 2009. This date established the year of the affected environment. The availability of suitable replacement housing in the communities of the relocated residents was analyzed in 2010. The analysis was considered to provide a good indication of the availability of replacement properties, but was not meant to be a substitute for a definitive list of the available housing stock.

For the Final EIR/EIS, the numbers of displaced residents were updated to account for changes in the project alignment. The 2010 analysis of suitable replacement housing, however, was not updated for the Final EIR/EIS. The Authority has adopted the California Department of Transportation (Caltrans) Right of Way Manual (Caltrans 2009a) as the basis for all business and residential relocations, and all relocation assistance will be administered in accordance with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act. The Authority's plan will include provisions that will ensure that all displaced residents are relocated to suitable replacement housing. Moreover, the relocation agents who will conduct the property appraisals and assist with relocation will have the local up-to-date housing stock information at the time of property acquisition.

### **L006-21**

The former Creighton Ranch Preserve is located over 1 mile west of the BNSF, Corcoran Bypass, and Corcoran Elevated alternatives. Because of the considerable distance, no direct or indirect impacts are expected to occur on former Creighton Ranch Preserve as a result of the project. Landscape-level impacts on wildlife movement and migration corridors in the region that may affect wildlife moving through the project vicinity are evaluated in Section 3.7.5 of the Final EIR/EIS.

### **L006-22**

Refer to Standard Response FB-Response-SO-01.

### **L006-23**

The footprint of the refuge track is provided in Appendix 3.1-A of Volume 2 of the EIR/EIS. The impacts caused by the refuge track are included in the analysis of the alternative alignments in the EIR/EIS.

### **L006-24**

EIR/EIS Sections 3.12.6 and 3.12.7 Affected Environment present a summary of county and community demographics, housing, economic conditions, community characteristics, and environmental justice populations in the four-county region to provide context for the project impacts. The source data from the California Department of Finance and U.S. Census Bureau include the institutionalized population in the total population numbers, and the potential for this to skew the data is always discussed in the text when the data are presented. The institutionalized population is not included in the data for the total household population count. This is appropriate because the community impacts detailed in Sections 3.12.8 and 3.12.9 Environmental Consequences occur as a result of residential, business, and community facility displacement along the HST right-of-way, and do not affect the inmate population.

### **L006-25**

Refer to Standard Response FB-Response-HWR-01.

### **L006-26**

Refer to Standard Response FB-Response-GENERAL-13.

### **L006-27**

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05, FB-Response-AVR-03.

### **L006-28**

Most Noise Elements contained in respective General Plans have similar objectives and policies. These were taken into account as part of the project.

### **L006-29**

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05.

## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

### **L006-29**

Several assumptions were made in regards to the amount of trains that are expected due to HST operations, and the estimated number of trains is taken into account in the noise model. Startle effects are discussed in Section 5.3 of the *Fresno to Bakersfield: Noise and Vibration Technical Report* (Authority and FRA 2012j).

### **L006-30**

Refer to Standard Response FB-Response-SO-02.

### **L006-31**

Refer to Standard Response FB-Response-AVR-03.

### **L006-32**

Mitigation Measure AVR-MM#2c requires that the Authority plant trees along the edges of right-of-way in locations adjacent to residential areas, thus substantially reducing the potential for blight from areas under the guideways. Similarly, under Mitigation Measure AVR-MM#2d, vegetation will be planted on lands acquired for the project that are not needed for the HST or related infrastructure, further reducing the potential for visual blight. Surface treatments to facilitate graffiti prevention and removal are specifically required for overcrossings, retained-fill elements, and sound barriers under Mitigation Measures AVR-MM#2f and #2g. However, such coatings would be applied to all structures (e.g., columns) that are susceptible to graffiti.

### **L006-33**

Refer to Standard Response FB-Response-GENERAL-05, FB-Response-SO-04, FB-Response-GENERAL-14, FB-Response-GENERAL-04, FB-Response-SO-01, FB-Response-SO-05.

For information on the impact to the community of Corcoran see EIR/EIS Volume I Section 3.12 Impact SO#6 and Impact SO#9 and Mitigation Measure SO-1. For information on the impacts to communities and on the potential for physical deterioration see Volume I Section 3.12 Impact SO #16. Also see Section 5.1.2 in the Community Impact Assessment Technical Report (Authority and FRA 2012h) and EIR/EIS Volume

### **L006-33**

I Section 3.12 Impacts SO#5 and SO#13 for information on project job creation during construction and operation. To address the concern of permitting impacted agricultural land, the Final EIR/EIS includes a new commitment (see Section 3.14.6, Project Design Features) to assist land owners in obtaining new or amended permits for the continued operation or relocation of the facility. For information on relocation assistance, see EIR/EIS Volume II Technical Appendix 3.12-A.

### **L006-34**

Refer to Standard Response FB-Response-AG-04.

As shown in Volume III of the EIR/EIS, Sweet Canal would be realigned to the east of the HST alignment where it runs roughly parallel to the HST. It would then be brought back west across the HST alignment at 4th Avenue. The canal would be placed in a pipe across the alignment. The design/build contractor would coordinate the realignment with the canal owner to minimize disruption of water supplies provided by the canal. Since this canal is used for irrigation, the relocation is expected to be done during those winter months when water supply from the canal is reduced or not required.

### **L006-35**

Refer to Standard Response FB-Response-LU-02.

These City of Corcoran policies are related to actions that the City of Corcoran would take in approving projects within its jurisdiction. Local land use plans are created by cities and counties with authority over the type and amount of land uses that can be developed in their areas. Therefore, the Authority has no authority over land use decisions in these areas

### **L006-36**

Refer to Standard Response FB-Response-GENERAL-12.

### **L006-37**

Refer to Standard Response FB-Response-GENERAL-12.

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## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

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### **L006-37**

The HST project includes no plans to discontinue Amtrak service to the Corcoran station or any other station or platform along the Fresno to Bakersfield Section corridor. If the BNSF Alternative is selected in the Corcoran area, the relocation of the facility would be completed prior to demolition of the existing structure, and no disruption to Amtrak service would occur. Therefore, it would not force the City of Corcoran to cease operating its local bus services.

### **L006-38**

The Corcoran Amtrak Station and transit center facility will be relocated in the vicinity of the existing station prior to demolition of the existing structure, and no disruption to Amtrak service would occur. During construction, the Authority will coordinate with the appropriate transit jurisdiction(s) before limiting access to public transit and limiting movement of public transit vehicles. Potential actions that would impact access to transit include, but are not limited to, relocating or removing bus stops, limiting access to bus stops or transfer facilities, or otherwise restricting or constraining public transit operations. Public transit access and routing will be maintained where feasible.

### **L006-39**

Refer to Standard Response FB-Response-TR-01.

### **L006-40**

Refer to Standard Response FB-Response-TR-01.

The Revised DEIR/Supplemental DEIS provides information on the roadway overpasses, such as width and clearance for the HST project. The width of roadway overpasses would accommodate farm equipment on the overpasses and would therefore accommodate school buses (which are narrower than farm equipment) traveling in opposite lanes. The clearance below the overpasses would range from 16.5 feet over roadways to 27 feet over railroad tracks. See Sections 2.2.4, Infrastructure Components, and 2.2.5, Grade Separations, in Chapter 2 of the Revised DEIR/Supplemental DEIS for more detail on roadway overcrossings.

On completion, Avenue 144 would benefit from the overcrossing by eliminating the

### **L006-40**

existing at-grade crossing with the BNSF railroad.

### **L006-41**

Refer to Standard Response FB-Response-TR-01.

Elevated road crossing design is discussed in Section 2.2.5, Grade Separations, of Chapter 2.0, Alternatives.

### **L006-42**

Refer to Standard Response FB-Response-S&S-01.

### **L006-43**

It is proposed to relocate the ramp slightly to the south and realign the ramp so that it will avoid the proposed location of the proposed HST aerial structure. Santa Fe Avenue would be closed, and traffic would access SR 43 via 5½ Avenue off of Orange Avenue. Refer to Impact TR #15 – Impacts on the City of Corcoran Local Roadway Network due to Road Closures in Section 3.2 of the Final EIR/EIS.

### **L006-44**

The HST would be traveling at a speed of over 200 miles per hour. Views by passengers of any given residence would thus last only a split second, so the likelihood of invasion of privacy of nearby residents would be virtually nil. Also, elevated segments near residences are often likely to require sound barriers, which would block views from the HST to those residences.

### **L006-45**

Refer to Standard Response FB-Response-N&V-03, FB-Response-GENERAL-07, FB-Response-GENERAL-16.

The apartment complex would not be displaced by the HST project and therefore the

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## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

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### **L006-45**

residents would not have received a notice about potential relocation. The Authority and FRA provided extraordinary outreach to the community and held several advertised public workshops in the project area, including Corcoran, to give the public an opportunity to ask questions and collect information about the project. Chapter 8, Public and Agency Involvement, describes the public and agency involvement efforts conducted. The structure's potential proximity to the HST tracks means it was evaluated in the noise and vibration analysis; see EIR/EIS Volume I Section 3.4 for more information.

The analysis of suitable replacement housing available in the communities of the relocated residents was performed in 2010. Such housing was considered to be a good indicator of the availability of replacement properties, but is not meant to substitute for a definitive list of the available housing stock. The relocation agents that will conduct the property appraisals and will assist with relocation will have the local and accurate housing stock information.

### **L006-46**

The Authority does not currently have air rights, which must be granted by the Legislature. At present, there are no allowable uses of the land under the viaduct other than existing roadways that cross the alignment.

### **L006-47**

The former Creighton Ranch Preserve is located over 1 mile west of the BNSF, Corcoran Bypass, and Corcoran Elevated alternatives. Because of the considerable distance, no direct or indirect impacts are expected to occur on former Creighton Ranch Preserve as a result of the project. Landscape-level impacts on wildlife movement and migration corridors in the region that may affect wildlife moving through the project vicinity are evaluated in Section 3.7.5 of the Final EIR/EIS.

### **L006-48**

Refer to Standard Response FB-Response-SO-01.

### **L006-49**

The footprint of the refuge track is provided in Appendix 3.1-A of Volume 2 of the EIR/EIS. The impacts caused by the refuge track are included in the analysis of alternative alignments in the EIR/EIS.

### **L006-50**

Section 3.19, Cumulative Impacts, evaluates the cumulative impact on floodplains. The 100-year floodplain is generally located both south and west of the city of Corcoran. The BNSF Alternative follows the existing transportation corridor within the city of Corcoran. Although the direction of city growth may already be influenced by existing transportation corridors, the HST would not substantially add to the effect as growth would be restricted in the floodplain and would, therefore, not be permitted.

### **L006-51**

EIR/EIS Sections 3.12.6 and 3.12.7, Affected Environment, present a summary of county and community demographics, housing, economic conditions, community characteristics, and environmental justice populations in the four-county region to provide context for the project impacts. The source data from the California Department of Finance and U.S. Census Bureau include the institutionalized population in the total population numbers, and the potential for this to skew the data is always discussed in the text when the data are presented. The institutionalized population is not included in the data for the total household population count. This is appropriate because the community impacts detailed in Sections 3.12.8 and 3.12.9, Environmental Consequences, occur as a result of residential, business, and community facility displacement along the HST right-of-way, and do not impact the inmate population.

### **L006-52**

Refer to Standard Response FB-Response-HWR-01.

### **L006-53**

Refer to Standard Response FB-Response-GENERAL-13.

### **L006-54**

Refer to Standard Response FB-Response-AVR-02, FB-Response-AVR-03.

## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

### L006-54

The Authority would maintain all HST facilities. Table 3.16-2 in Section 3.16, Aesthetics and Visual Resources, of the Revised DEIR/Supplemental DEIS has been revised to address graffiti and blight. Also, mitigation measures for construction have been revised to state that: "Any graffiti or visual defacement of temporary fencing and walls will be painted over or removed within 5 business days." Mitigation measures for operations have been revised to state that: "Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable time after notification."

### L006-55

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05.

Most Noise Elements contained in respective General Plans have similar objectives and policies. These were taken into account as part of the project.

### L006-56

Refer to Standard Response FB-Response-AVR-03.

### L006-57

The comment is referencing Chapter S.0, Summary, which provides a summary of the impacts discussed in Section 3.15, Parks, Recreation, and Open Space. Section 3.15 states that construction within 300 feet of a park, recreation, or open-space resource or a school district play area or recreation facility would have the greatest noise impact, depending on the construction type and activity. Parks farther than 300 feet from construction are generally sufficiently remote to remain comparatively unaffected for most construction activities. Project impacts are limited to park resources within 100 feet of an alignment. As described in Table 3.15-2, Christmas Tree Park is 724 feet from the BNSF Alternative and therefore would not be subject to construction or project period effects. The open space area along Otis Avenue is not designated as a park or recreation resource by the City of Corcoran, Kings County, or any other entity.

### L006-58

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05.

### L006-58

Several assumptions were made in regards to the amount of trains that are expected due to HST operations, and the estimated number of trains is taken into account in the noise model. Startle effects are discussed in Section 5.3 of the *Fresno to Bakersfield: Noise and Vibration Technical Report* (Authority and FRA 2012j).

### L006-59

Refer to Standard Response FB-Response-SO-02.

For information on potential HST project impacts on property values see Section 5.4.4.3 in the Community Impact Assessment Technical Report (Authority and FRA 2012h).

### L006-60

Refer to Standard Response FB-Response-GENERAL-04, FB-Response-GENERAL-14, FB-Response-SO-05, FB-Response-AG-06.

See EIR/EIS Volume I Section 3.14 Impact AG#4 for information on the permanent conversion of agricultural land, and see Mitigation Measure AG-1 in Volume I Section 3.14 for measures to preserve the total amount of prime farmland. For information on the project effects on agricultural business and economic effects on agriculture, see EIR/EIS Volume I Section 3.12 Impacts SO#11 and SO #15. For information on the HST operation-related property and sales tax revenue effects see Volume I Section 3.12 Impact SO#3, Impact SO#4, and Impact SO #12. See Volume I Section 3.12 Impact SO#15 and Volume II Technical Appendix 3.14-B for impacts to confined animal agriculture. The Authority has committed to maintaining a "permit bureau" to help businesses (including confined animal operations) overcome the regulatory disruptions caused by the project.

### L006-61

Refer to Standard Response FB-Response-LU-02.

These City of Corcoran policies are related to actions that the City of Corcoran would take in approving projects within its jurisdiction. Local land use plans are created by

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## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

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### L006-61

cities and counties with authority over the type and amount of land uses that can be developed in their areas. Therefore, the Authority has no authority over land use decisions in these areas

### L006-62

Refer to Standard Response FB-Response-GENERAL-12.

### L006-63

Refer to Standard Response FB-Response-GENERAL-12.

The HST project includes no plans to discontinue Amtrak service to the Corcoran station or any other station or platform along the Fresno to Bakersfield Section corridor. If the BNSF Alternative is selected in the Corcoran area, the relocation of the facility would be completed before the existing structure is demolished, and no disruption to Amtrak service would occur. Therefore, it would not force the City of Corcoran to cease operating its local bus services.

### L006-64

The Corcoran Amtrak Station and transit center facility will be relocated before demolition of the existing structure, and no disruption to Amtrak service would occur. During construction, the Authority will coordinate with the appropriate transit jurisdiction(s) before limiting access to public transit and limiting movement of public transit vehicles. Potential actions that would impact access to transit include, but are not limited to, relocating or removing bus stops, limiting access to bus stops or transfer facilities, or otherwise restricting or constraining public transit operations. Public transit access and routing will be maintained where feasible.

### L006-65

No HST alternatives in the Corcoran area would cause through roads, collectors, or arterials to be more than a half mile apart. Policy 2.74 and 2.75 are discussed further in Section 3.13, Appendix A, Land Use Plans, Goals, and Policies.

### L006-66

Roadways having average daily travel (ADT) greater than 2000 are provided 8-foot shoulders consistent with the existing roadway condition. Grade separations comply with Caltrans standards for stopping sight distance.

Coordination with the City of Corcoran will continue during the design process to address maintenance of traffic questions and concerns.

### L006-67

Refer to Standard Response FB-Response-S&S-01.

The new overpass connection between 4th Avenue and Road 24 would occur outside of the city of Corcoran boundaries. The overpass would provide an east-west connection to replace Avenue 144.

### L006-68

Refer to Standard Response FB-Response-S&S-01.

### L006-69

Refer to Standard Response FB-Response-S&S-01.

As indicated in Appendix 2-A of the EIR/EIS, the project will not close 5 1/2 Avenue at any location, including the intersection of SR 43 and 5 1/2 Avenue.

### L006-70

Refer to Standard Response FB-Response-SO-03, FB-Response-SO-05.

For information on the HST operation-related property and sales tax revenue effects see EIR/EIS Volume I Section 3.12 Impact SO#3, Impact SO#4, and Impact SO #12. The total number of businesses that would need relocation in the City of Corcoran and the number of employees employed by these business are reported in Impact SO #10. These business relocations were identified using GIS data and the project footprint. The types of businesses that will require relocation were identified based on the North American Industry Classification System. This information is provided to help readers

## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

### **L006-70**

understand the likelihood that these businesses would relocate, especially when combined with the information provided about the availability of suitable properties for these businesses. As described in Section 3.12.10, the Authority will develop a relocation mitigation plan, in consultation with affected cities and counties, which will minimize the impacts on businesses.

### **L006-71**

Refer to Standard Response FB-Response-GENERAL-05, FB-Response-SO-04.

See Section 5.4.5 of the Community Impact Assessment Technical Report (Authority and FRA 2012h) for the complete analysis performed to measure all potential effects associated with construction and operation, and an examination to determine if it could reasonably be expected that the resulting changes to a community would lead to physical deterioration. As described in EIR/EIS Volume I Section 3.12 Impact SO #16, although the project would cause the displacement of homes and businesses in Corcoran, no evidence was found that any of these displacements or the resulting social and economic consequences would result in physical deterioration of communities.

The BNSF Alternative in Corcoran has the potential to relocate several businesses along Otis Avenue. The sales revenue from all potentially displaced businesses represents 0.88% of the sales tax revenue received by the City of Corcoran. The total taxable sales of these businesses comprise 7.5% of the total taxable sales revenue collected in the city. These percentages suggest that (1) the potential fiscal effects to local sales tax revenues are minor and (2) the businesses being affected by the project do represent a considerable percentage of total city taxable sales. Therefore, while the potential for physical deterioration from fiscal effects is small, the businesses are important to the overall city economy and a small amount of suitable current vacant replacement properties leaves open the possibility that businesses may find it necessary to relocate outside the city. Therefore, the Authority will consult with the city to ensure that these businesses have suitable relocation alternatives in Corcoran. There are some existing vacancies to house some of these businesses (see specific details of the gap analysis in Section 5.2.3 of the Community Impact Assessment Technical Report) so it is not expected that all of these businesses would relocate outside the city. In addition, Corcoran has vacant land available in its local Business Park for relocating these

### **L006-71**

businesses. As a result, it is anticipated that the majority of these businesses will relocate in the area and no physical deterioration will result, and therefore no mitigation is required.

### **L006-72**

Refer to Standard Response FB-Response-GENERAL-05, FB-Response-SO-05, FB-Response-LU-04, FB-Response-SO-03.

(3) The analysis of potential job loss due to business displacement and relocation was performed by alternative, and the results are presented in EIR/EIS Volume I Section 3.12 Impact SO #10. The analysis does not conclude that all potentially displaced employees would lose their jobs and does not perform a comparison between potential employees displaced and the total population size (with or without the inmate population). A gap analysis of available properties was performed in Section 5.2.3 of the Community Impact Assessment Technical Report (Authority and FRA 2012h). The analysis examines all potentially relocated businesses and the results show that each community in the surrounding locations has a suitable number of replacement properties. Because the Authority is required to provide relocation assistance under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, all the displaced businesses would be relocated; most, if not all, within the surrounding area, and their employees would remain employed.

(4) See EIR/EIS Volume I Section 3.12 Impact SO #1 for information about the potential for construction activities to disrupt business activity. Detailed construction access plans will be developed before the start of construction, and the affected cities would review these plans before construction implementation. Although access to some businesses would be disrupted and detoured for short periods during construction, access would always be maintained; see TR MM#1- Access Maintenance for Property Owners, which says that during construction, access will be maintained for owners to their property to a level that maintains pre-project viability of the property for its pre-project use. If a proposed road closure restricts current access to a property, alternative access via connections to existing roadways will be provided. If adjacent road access is not available, new road connections will be prepared, if feasible. If alternative road access is not feasible, the property will be considered for acquisition.

## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

### **L006-72**

(5) The analysis in Volume I Section 3.12 Impact SO#3, Impact SO#4, and Impact SO#12 examined the HST construction and operation-related property and sales tax revenue effects. This analysis evaluated potential effects based on existing conditions, as required under CEQA, and does not include a speculative analysis or mitigation for unproven future loss of revenue from proposed land development.

(6) The analysis in Section 3.12 describes how a short-term reduction in property tax revenues may occur due to property acquisition by removing parcels from county tax rolls. This estimated amount ranges from a low of 0.03% of the total fiscal year 2009-2010 property-tax revenue of Tulare County to a high of 0.2% in Kings County. Therefore, the intensity is negligible for all alternatives, because the economic impact is measurable, but would not be perceptible to community residents. Some short-term reductions in sales tax revenues are expected because the need to acquire land will necessitate the relocation of businesses along the project alignment. Although relocations in the same vicinity would limit losses in sales tax revenues for local jurisdictions, the potential for temporary sales tax loss would remain, either because businesses would temporarily close during these relocations or because some might choose to close down rather than relocate. The expected annual gain in sales tax revenue from project spending is greater than the expected loss from business relocation. The project would generate an estimated \$1.5 million annually in direct new sales tax revenues for the region through project spending on operation and maintenance.

### **L006-73**

Refer to Standard Response FB-Response-GENERAL-08.

### **L006-74**

Refer to Standard Response FB-Response-S&S-01.

Orange Avenue would remain open during construction of the Orange Avenue overpass. The road, however, would be closed for one to two days when the new overpass is connected at either end to the existing road. During this time, emergency services responding in an east-west direction would have up to about 2 miles of out-of-direction

### **L006-74**

travel. Assuming an average travel time of 30 miles per hour, this could add up to 4 minutes to the response time of emergency services. During operation, the Orange Avenue overpass would not alter existing emergency response times.

### **L006-75**

Refer to Standard Response FB-Response-AVR-04.

Depending on the alternative selected, views to and from overcrossings and residences could occur at close distances, with undesirable effects to residents, including decline in visual quality and visual invasion of privacy.

Under Mitigation Measure AVR-MM#2f: Landscape Treatments along the HST Project Overcrossings and Retained Fill Elements of the HST, the Authority will consult with the affected cities and counties regarding the landscaping program for planting the slopes of the overcrossings and retained-fill elements. This program would include measures for providing screening of residences, where desired. Also, Mitigation Measure AVR-MM#2e calls for provision of offsite landscape screening for residents experiencing significant impacts if the onsite screening measures would not adequately address those impacts.

The HST would be traveling at a speed of over 200 miles per hour. Views by passengers of any given residence would thus last only a split second, so the likelihood of invasion of privacy of nearby residents would be virtually nil. Also, elevated segments near residences are often likely to require sound barriers, which would block views from the HST to those residences.

### **L006-76**

Refer to Standard Response FB-Response-SO-01.

Public notification regarding the draft environmental documents took place in the following ways: A notification letter, informational brochure, and notice of action were translated in English and Spanish and sent to landowners and tenants within 300 feet of all alignment alternatives. The letters notified landowners and tenants that their property may be needed for construction (within the project construction footprint) of one or more

## Response to Submission L006 (Kindon Meik, City of Corcoran, October 18, 2012) - Continued

### **L006-76**

of the alignment alternatives or project components being evaluated. Anyone who has requested to be notified or is in our stakeholder database was sent notification materials in English and Spanish. An e-mail communication of the notification materials was distributed to the entire stakeholder database.

Public notices were placed in English and Spanish newspapers. Posters in English and Spanish were posted along the project right-of-way. The analysis of suitable replacement housing available in the communities of the relocated residents was performed in 2010. The results were considered to be a good indicator of the availability of replacement properties, but are not meant to substitute for a definitive list of the available housing stock. The relocation agents that will conduct the property appraisals and will assist with relocation will have the local and accurate housing stock information.

### **L006-77**

The West Hanford Bypass would not preclude the construction of the new police department/public safety facility on Otis Avenue; therefore, there is no need to identify a new site or discuss compensation for the site.

### **L006-78**

The former Creighton Ranch Preserve is located over 1 mile west of the BNSF, Corcoran Bypass, and Corcoran Elevated alternatives. Because of the considerable distance, no direct or indirect impacts are expected to occur on former Creighton Ranch Preserve as a result of the project. Landscape-level impacts on wildlife movement and migration corridors in the region that may affect wildlife moving through the project vicinity are evaluated in Section 3.7.5 of the Final EIR/EIS.

### **L006-79**

The footprint of the refuge track is provided in Appendix 3.1-A of Volume 2 of the EIR/EIS. The impacts caused by the refuge track are included in the analysis of alternative alignments in the EIR/EIS.

### **L006-80**

Refer to Standard Response FB-Response-SO-01.

### **L006-81**

Section 3.19, Cumulative Impacts, evaluates the cumulative impact on floodplains. The 100-year floodplain is generally located both south and west of the city of Corcoran. The BNSF Alternative follows the existing transportation corridor within the city of Corcoran. The BNSF Alternative would be at-grade north of Patterson Avenue, but elevated south of Patterson Avenue. The Orange Avenue crossing would be maintained as would the Otis Avenue frontage road. The Corcoran Elevated Alternative is elevated between Niles Avenue and Avenue 152, over most of the urbanized area of the city. Although the direction of city growth may already be influenced by existing transportation corridors, the HST would not substantially add to the effect that existing transportation corridors have on the direction of future growth.

### **L006-82**

EIR/EIS Sections 3.12.6 and 3.12.7, Affected Environment, present a summary of county and community demographics, housing, economic conditions, community characteristics, and environmental justice populations in the four-county region to provide context for the Project impacts. The source data from the California Department of Finance and U.S. Census Bureau include the institutionalized population in the total population numbers, and the potential for this to skew the data is always discussed in the text when the data are presented. The institutionalized population is not included in the data for the total household population count. This is appropriate because the community impacts detailed in EIR/EIS Sections 3.12.8 and 3.12.9, Environmental Consequences, occur as a result of residential, business and community facility displacement along the HST right-of-way, and do not affect the inmate population.

### **L006-83**

Refer to Standard Response FB-Response-HWR-01.

All reasonable efforts will be made to make utility relocations with no interruption of service. In many cases, particularly in urban areas, this can be accomplished because of redundancy in the utility system. In the event that it will be necessary to interrupt service, the length of the interruption will be minimized by first constructing the relocation and then shutting down the existing utility feature (e.g., water or sewer pipeline) only long enough to connect in the relocation. This type of shutdown would be

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Response to Submission L006 (Kendon Meik, City of Corcoran, October 18, 2012) - Continued

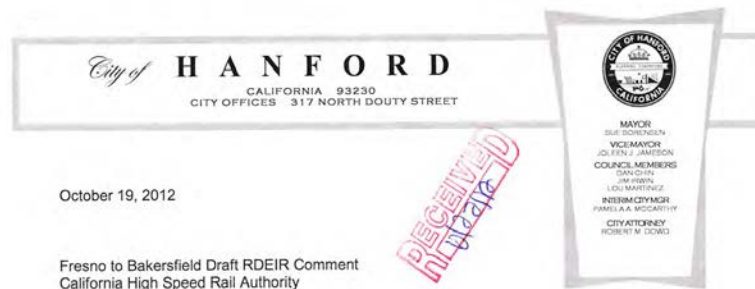
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**L006-83**

coordinated with the utility provider to schedule the shutdown during the least disruptive time period. Utility customers would also be notified of pending shutdowns and their duration.

Submission L007 (Melody Haigh, City of Hanford, October 18, 2012)

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October 19, 2012

Fresno to Bakersfield Draft RDEIR Comment  
California High Speed Rail Authority  
770 L St., Suite 800  
Sacramento, CA 95814

On July 20, 2012 the California High Speed Rail Authority (HSRA) and the Federal Railroad Administration (FRA) released the Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR) for the Fresno to Bakersfield section of the California High-Speed Train (HST) Project. Initially public comment period was for a 60-day review period ending on September 20, 2012; however, an additional 30-day review period was granted ending on October 19, 2012.

L007-1 | In accordance with City Council Resolution No. 10-39-R dated July 20, 2010, the City of Hanford (City) continues to oppose the HSRA's plan to include an alignment within Kings County that is not along a "major transportation corridor" as was approved with Proposition 1A. There are currently three alignments within the Fresno to Bakersfield Section of the RDEIR that the City is choosing to respond to in order to ensure that the HSRA has mitigated all of the identified impacts to the City of Hanford and to protect its interest in any future potential litigation should that become necessary.

L007-2 | In order to assess the significant environmental impacts that will be caused by the proposed rail alignments and the proposed mitigation measures, the City must review the RDEIR document. The burden of reviewing and commenting on the RDEIR within the designated comment period is unreasonable and disproportionate to small agencies with limited staff, such as Hanford. The original document consisted of multiple volumes with over 3,300 pages containing summary information with references to thousands of additional pages of text and graphics in separate documents, some of which are included as appendices and some are not. The current RDEIR incorporates additional pages of text, maps, and drawings that introduce significant changes, including an additional alignment and a station located west of Hanford. The methodology and approach utilized to prepare the RDEIR fails to fully identify and analyze impacts to the Hanford and Kings County community in the manner required by Public Resources Code Section 21100(b) and 14 CCR 15126.2(a). Furthermore, it has been impossible to develop a complete understanding of how the technical studies and supporting documents were utilized to reach the conclusions presented in the RDEIR. This dilemma is magnified by the fact that an already small staff typical of medium and small cities like Hanford has been reduced further due to economic conditions. The short period to review the RDEIR deprives the City of a meaningful opportunity to thoroughly analyze environmental impacts in a manner that would allow the City to protect its residents.

• COMMUNITY DEVELOPMENT: 559-585-2580 • FACSIMILE: 559-583-1633

This response is in addition to the comments provided to the HSRA by letter on October 13, 2011 relating to the original RDEIR. A significant number of comments and questions addressed in the City's response still have not been addressed by the RDEIR.

In general, the HST conflicts with the City's General Plan objectives. We have identified the following conflicts which need to be addressed and mitigated.

- L007-3 | Objective LU8: Minimize conflicts between residential uses and other incompatible land uses. Policy 8.1 states that "appropriate buffers or other effective measures shall be included in development plans to ensure that conflicts such as noise, odor, light, glare, dust, or other potentially significant adverse environmental conditions are minimized". The RDEIR has not adequately addressed the adverse impacts to the HST with the residential uses shown in the General Plan along the Hanford West Bypass Alignment.
- L007-4 | Objective LU10: "Create a planned commercial development served by 12<sup>th</sup> Avenue and Lacey Blvd. that serves the local and regional shopping needs of Hanford and the surrounding area that does not conflict with the Hanford Downtown". The socioeconomic impacts of the HST on the regional shopping area of 12<sup>th</sup> Avenue and Lacey Blvd. have not been addressed in the RDEIR. This commercial shopping area is responsible for \$3.4 million per year in sales tax revenues which is almost one-half of the City's sales tax portion of the General Fund Revenue. No analysis of impacts of the HST to this regional retail area has been identified or mitigated in the RDEIR. This economic impact also conflicts with Objective HZ6 noted below.
- L007-5 | Objective LU24: "Resist the premature conversion of agricultural lands to urban uses". The conversion of agricultural land for the HST and the potential station is premature at best. The HSRA's desire to surround the HST stations with urban uses and the requirement to comply with AB 32 and SB 375 require more dense development in urban uses. This issue has not been addressed in the RDEIR.
- L007-6 | Objective C11: "Establish a circulation system that is consistent with the land use patterns of the City". The Hanford West Bypass Alignments cut through Hanford's General Plan Boundary and bisects many arterial and collector streets. Only the major arterials provided cross access to the HST which is in conflict with this objective and all of the adopted policies. This issue has not been adequately addressed in the RDEIR.
- L007-7 | Objective C18: "Promote maximum opportunities for pedestrian traffic throughout the City by continuing to develop and maintain a safe sidewalk system that facilitates pedestrian access....". The HST bisecting the west side of our community will eliminate opportunities to maximize pedestrian traffic. The elimination of street crossings will increase pedestrian travel distances to destination points and will reduce desire to walk, thereby increasing vehicular traffic. This issue has not been adequately addressed in the RDEIR.
- L007-8 | Objective OCR1: "Support preservation of existing agricultural lands at the periphery of the Hanford Planning Area". The HSRA's desire to surround the HST stations with urban uses and the requirement to comply with AB 32 and SB 375 require more dense development in urban uses. This land use has been transferred from the core of Hanford to its periphery in direct conflict with this objective. This issue has not been addressed in the RDEIR.
- L007-9 | Objective HZ6: "Protect the residents of Hanford from the harmful and annoying effect of excessive noise and protect the City's economic base by preventing incompatible land uses

Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

Page 3

- L007-9 | from encroaching upon existing or planned noise-producing uses". The HST will generate noise levels in excess of those adopted as part of the General Plan. The RDEIR does not mitigate these impacts, instead the RDEIR identifies that sound barriers are not suitable on any alignment because they are shown to be economically unfeasible. In order to make a claim of economic infeasibility, the HSRA must show the basis for that determination in the record. The HSRA cannot simply say that the mitigation is too expensive and therefore not provide any mitigation. This impact is in conflict with this objective and all of the policies adopted by the City. This issue has not been adequately addressed in the RDEIR.
- L007-10 | Objective PF1: "Provide sufficient levels of facilities and services prior to or concurrent with planned development". Sewer and water infrastructure has been designed and master planned to service very low density development surrounding 13<sup>th</sup> Avenue. The addition of HST and a station to the west side would require more dense development than that which has currently been addressed and therefore facilities that are already installed would be smaller than needed to serve the more dense developments. This issue has not been adequately addressed in the RDEIR.
- L007-11 | Objective PF2: "New development shall pay fees as necessary to meet all identified costs associated with new development". New development shall be responsible for the public costs attached to each development. As outlined later in this letter, the City will have significant future costs to infrastructure and maintenance as a result of the HST and these issues have not been addressed in the RDEIR.
- These direct conflicts with the City's General Plan show that the RDEIR is inadequate with regards to the NEPA evaluation. In the Federal Register Volume 64, No. 101, dated May 26, 1999, the Federal Rail Administration ("FRA") announced its revised procedures for considering environmental impacts. Since the FRA is the approving body for the NEPA document, the RDEIR needs to meet the standards established by the FRA.
- Section 3.2 – Transportation**
- L007-12 | Comment: In scoping the Traffic Impact Study (TIS) portion of the RDEIR/Supplemental EIS for the Hanford West Bypass HST alignment alternative, no input was sought from the City's Planning Department or Public Works Department staff. This is a serious shortcoming which should be rectified in the final environmental documentation for the Fresno to Bakersfield HST segment of the HSR Project.
- L007-13 | Comment: According to the 2008 SR 198 Corridor System Management Plan, endorsed both by Caltrans and the Kings County Association of Governments, the Lemoore-Hanford segment of SR 198, an existing 4-lane freeway segment, is projected to reach Level of Service (LOS) "F" between the years 2020 and 2030. This LOS "F" projection was made prior to conception of the Hanford West Bypass Alternative HST alignment. If the Kings/ Tulare Regional Station (KTRS) were to be located west of Hanford, as discussed in the RDEIR/ Supplemental EIS documents, and if construction of the KTRS were to be completed within the 2020- 2030 timeframe as projected, it would certainly accelerate the onset of LOS "F" conditions on the Lemoore Hanford segment of SR 198. Analysis of the foregoing is lacking in the RDEIR/Supplemental EIS, and should be included in the final environmental documentation for the HST project.
- L007-14 | Comment: 13th Avenue, Lacey Boulevard, Hanford Armona Road, and Houston Avenue are designated as Arterial Streets in the city's General Plan, and are therefore planned as a 4-lane Divided Arterial Street at ultimate development. In discussing the transportation and traffic

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- L007-14 | impacts of the Hanford West Bypass HST alternative alignments and the potential location of the Kings/ Tulare Regional Station (KTRS) adjacent to these arterial streets and the interchange with SR 198, the RDEIR/ Supplemental EIS assumes that these arterial streets will remain a 2-lane facility. Traffic impact mitigations such as signal light installations and overcrossings/undercrossings need to be designed to accommodate the ultimate width of these arterials. If not, the HSRA needs to mitigate the additional costs for expansion of these facilities to accommodate ultimate growth within the City's Sphere of Influence.
- L007-15 | Comment: The RDEIR does not address the crossing with Glendale Avenue north of SR 198 and its ultimate width. Glendale Avenue east of the West Alignment exists to its ultimate design width. The crossing of the HSR will need to be widened to mitigate the ultimate design width or the HSRA provide other financial mitigation for future widening.
- L007-16 | Comment: Table 3.2-9 of the RDEIR refers to Intersection ID 12 as Mall Drive/Lacey Boulevard. We believe that it should be 12th Avenue/Lacey Boulevard.
- L007-17 | Comment: Figure 3.2-15 of the RDEIR identifies roadway classifications for evaluation of traffic and only identifies current classifications. The City's General Plan Circulation Element should be consulted to verify roadway classifications. The RDEIR/EIR incorrectly identifies Intersection ID 12 as Mall Drive/Lacey Boulevard. We believe that it should be 12th Avenue/Lacey Boulevard.
- L007-18 | Comment: Impact TR#10 addresses changes in conventional passenger rail service on page 3.2-71. This discussion centers on physical impacts and disregards socioeconomic and environmental impacts of the proposed interim use of the IOS for Amtrak service. The Hanford station will endure significant impacts in the near term as well as long term if any of the HST is used for Amtrak service.
- L007-19 | Comment: Impact TR#11 addresses roadway crossings and identifies Grangeville Boulevard and Lacey Boulevard as undercrossings. Based upon the information in the RDEIR only Lacey Boulevard would be an undercrossing if Hanford Bypass 2 is chosen. Please correct.
- L007-20 | Comment: Impact TR#11 addresses road closures and identifies S. 10th Avenue in Kings County for closing. 10th Avenue provides a major truck route through Kings County and the City. The air quality impacts associated with the closing of S. 10th Avenue and the increase of VMT need to be addressed.
- L007-21 | Comment: Impact TR#13 addresses impacts to transit and parking adjacent to station alternatives. The RDEIR identifies funds to be used for planning a station and its adjacent uses, but does not include funds to construct stations. The impacts identified and determined to be less than significant require construction of a station to a capacity addressed in the RDEIR. In order to adequately mitigate the issues relating to a station, the HSRA needs to provide funding for local agencies. The HSRA cannot mitigate impacts based upon station design and then place the burden of the construction of the station on the local governments.
- L007-22 | Comment: Section 3.2.6 Project Design Features item #11 identifies special features that will be implemented in Fresno and Bakersfield for construction related impacts. Similar impacts to the City roadway network with similar mitigations need to be identified and addressed. Providing Construction Message Signs for adequate notification to motorists, maintaining vehicle detection of traffic at signals to eliminate congestion due to fixed timing, preparation of a

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L007-22	traffic management plan, grade separation, etc. are not identified as mitigation measures in the RDEIR.
L007-23	<u>Comment:</u> Impacts to the 13th Avenue/SR 198 interchange on the West Alternative are inadequately mitigated. The City has approved projects that already include the mitigations identified in the RDEIR. The additional traffic to this interchange as a result of the Hanford West alignment will require modification/reconstruction of the interchange. The previously approved projects within the City have mitigations of construction of traffic signals at this intersection. The Future Plus Project mitigations need to evaluate future planned projects in Hanford and provide appropriate mitigation measures.
L007-24	The RDEIR documents for the Hanford West Bypass alignment alternatives do not adequately address, or fail to address the following: <ol style="list-style-type: none"> <li>1. The need for an HST crossing structure at Hume Avenue. Hume Avenue is designated as a Major Collector Street in the Transportation/Circulation Element of the city's General Plan; therefore installation of an HST crossing structure built to full Major Collector width would be needed at Hume Avenue to assure General Plan compliance for future development in the vicinity of the HST alignment.</li> <li>2. The Below Grade HST West alignment should be extended south of Houston Avenue before transitioning to surface grade. This would provide mitigation to unnecessary noise and visual impacts to planned residential development of the adjacent area designated by the City's General Plan.</li> </ol> <p><b>Section 3.3 Air Quality and Global Climate Change</b></p> <p><u>Comment:</u> The detailed analysis of wind induced fugitive dust emissions is vague and does not provide a thorough analysis. A significant portion of land adjacent to the proposed alignments are in some form of agricultural production. These lands are subject to plowing and at certain times in the year are bare and subject to dust emissions when the train passes by at speeds of over 200+ miles per hour. These dust blows have the potential to be very disruptive to nearby roads and highways as evidenced by current problems associated with field burns by farmers and the traffic hazards created on nearby highways. More analysis of this issue needs to be completed before it can be concluded that this is not a significant impact on air quality and safety within the City.</p> <p><b>Section 3.4 Noise &amp; Vibration</b></p> <p><u>Comment:</u> All three alignments within Kings County (at grade or below grade) have significant impacts of noise on receptor and major receptors. The RDEIR identifies that sound barriers are not suitable on any alignment because they are shown to be economically unfeasible. In order to make a claim of economic infeasibility, the HSRA must show the basis for that determination in the record. The HSRA cannot simply say that the mitigation is too expensive and therefore not provide any mitigation.</p> <p><b>Section 3.6 Public Utilities and Energy</b></p> <p><u>Comment:</u> Proper development and build-out of the City's General Plan Area will require construction of Master Plan water mains, sanitary sewer lines, and storm drain pipeline facilities. City pipeline infrastructure must primarily be located within the grid of existing or future public</p>

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L007-27	street rights of way, in accordance with the General Plan. Existing and future pipeline infrastructure has not been adequately addressed in the RDEIR. Several overcrossings/undercrossings are proposed for the HST on the Hanford West Bypass Alignment Alternative without discussion of how to mitigate future expenses to the City to service the area within the City's General Plan on the west side of the HST. The introduction of the HST will require future boring, realignments, or other mitigation measures that again the City has not planned for. These additional infrastructure costs as a result of the HST have not been mitigated by the HSRA.
L007-28	<u>Comment:</u> The Hanford West Bypass Alignment Alternative would necessitate relocation of two (2) existing electrical utility substations, a very significant short term and long term impact to existing energy facilities in the vicinity of the City of Hanford. Mitigation of these impacts is not clearly identified in the RDEIR.
L007-29	<u>Comment:</u> Impact PU&E#5 - Conflicts with Existing Utilities. The Hanford West Bypass Alignment Alternative would impact existing drainage basins. The RDEIR identifies that the mitigation proposed would be to provide additional capacity within the utility footprint or adjusting the HST alignment to avoid impacts. The identification of mitigation measures is exactly why an RDEIR is required for a project; yet, the HSRA has failed to determine whether there is sufficient capacity within the existing footprint to mitigate. "Impermissible deferral of mitigation measures occurs when an EIR puts off analysis. . . without either setting standards or demonstrating how the impact can be mitigated in the manner described in the EIR." <i>City of Long Beach v. Los Angeles Unified School Dist.</i> (2009) 176 Cal.App.4 <sup>th</sup> 889, 915, 98 Cal.Rptr.3d 137. These issues should be addressed prior to approval of the RDEIR. The RDEIR is lacking on many of these types of issues where the mitigation is "we'll take care of it later". That is unacceptable for a project of this magnitude. The RDEIR should provide specific mitigation measures that can be fully implemented into the final project.
L007-30	<b>Section 3.7 Biological Resources and Wetlands</b> <u>Comment:</u> The RDEIR/Supplemental EIS, citing references to Table 3.7-6, Appendix 3.7-B, and Attachment 2, indicates that adoption of a Hanford West Bypass HST alternative alignment would result "...in slightly more temporary direct impacts on natural habitats suitable for special-status wildlife species" than the BNSF Hanford East alignment alternative. The RDEIR/Supplemental EIS lacks sufficient detail with respect to natural resources in the immediate City vicinity and General Plan Area, e.g., according to the DEIR/Supplemental EIS plan exhibits, the Hanford West Bypass would transect the Lone Oak Slough, a natural drainage catchment remnant which extends nearly one-half mile north of Houston Avenue. The slough is of variable width and depth along its meandering course, and is of sufficiently large size that it has never been filled in, although adjacent lands have been leveled and cultivated for agricultural purposes since the late nineteenth century. The Lone Oak Slough contains elderberry shrubs, a native plant species which is the sole food source for the Valley Elderberry Longhorn Beetle, a Federal Threatened Species. Construction of the Hanford West Bypass HST alternative alignment would likely result in permanent, rather than temporary impacts to the slough habitat.
L007-31	<b>Section 3.8 Hydrology and Water Resources</b> <u>Comment:</u> The construction of the Hanford West Bypass Alignment Alternative is adjacent to meandering waterways including the Last Chance Ditch. Groundwater in this area can be as shallow as 25 feet during certain times of the year. The RDEIR does not identify boring logs in this area that would potentially identify these types of concerns. Since the RDEIR does not go

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L007-31	<p>into this level of detail the identification of impacts and mitigations are not addressed adequately. Significant additional detail is necessary to fully understand the impacts to the groundwater in this area as a result of this project.</p> <p><b>Section 3.11 Safety and Security</b></p>
L007-32	<p><u>Comment:</u> The RDEIR makes no mention of the potential safety and security risks of the electrified HST with pedestrians. Unless fencing or another security measure is installed along the entire length of the HST, pedestrians will be able to access HST right-of-way and potentially have conflicts with the HST or the electrified cables, etc. No mention of these types of impacts were discussed in the RDEIR. Furthermore, if fencing is utilized to secure the railway from intrusion, the RDEIR should identify the entity that will be responsible for regular inspections to ensure that no breaches exist. The City lacks the personnel and funding to undertake such inspections.</p> <p><b>Public Safety Fire</b></p> <p><b>Mitigation Measures</b></p>
L007-33	<p>Impact fees alone will not mitigate or lower impacts to a less than significant level and we believe that further analysis is warranted. Suggested mitigation measures are:</p> <ol style="list-style-type: none"> <li>1. There will be a need to construct a fire station on the east side or on the west side of the high-speed rail tracks depending on the alignment selected to maintain current response times. Additional staff will be required by the construction of a new fire station due to high speed rail.</li> <li>2. Additional staff to meet the demands for growth – per National Standards for Fire Fighters.</li> <li>3. Additional Fire apparatus, such as a ladder truck and engines due to the new fire station construction due to HST.</li> <li>4. Additional radio equipment for interoperability.</li> <li>5. Special equipment for accidents.</li> <li>6. Specialized training to handle HST incidents</li> <li>7. Fire sprinkler system required for all buildings 2-1/4 miles away from a station.</li> </ol> <p><b>Public Safety Law Enforcement</b></p>
L007-34	<p>The RDEIR fails to discuss the following significant impacts for public safety with respect to law enforcement and fails to identify corresponding mitigation measures.</p> <p><b>Westside Track (Ground Level)</b></p> <ol style="list-style-type: none"> <li>1. Vandalism to station buildings, trains, tracks and/or gates if not fenced off.</li> <li>2. Graffiti to stopped trains, buildings, gates and concrete retaining walls for over road tracks.</li> </ol>

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L007-34	<ol style="list-style-type: none"> <li>3. Homeless magnet which includes issues such as, creating encampments, loitering and panhandling.</li> <li>4. Parking lot safety for parked vehicles (burglaries and theft), as well as riders as they walk to and from the trains.</li> <li>7. Will require constant patrol checks and officers getting out and checking the well being of persons waiting for passengers, rides, and or trains.</li> <li>8. Will increase police calls for service for all types of issues.</li> </ol> <p><b>Westside Track (below ground level)</b></p> <ol style="list-style-type: none"> <li>1. Possible vandalism to station buildings, trains, tracks and/or gates and fences.</li> <li>2. Graffiti to stopped trains, buildings, gates.</li> <li>3. Homeless magnet which includes issues such as encampments, loitering and panhandling.</li> <li>4. Parking lot safety for parked vehicles (burglaries and theft), as well as riders as they walk to and from the trains.</li> <li>5. Will require constant patrol checks for safety issues for riders, persons picking up passengers and employees.</li> <li>6. Will increase police calls for service for all types of issues.</li> </ol> <p><b>Section 3.12 Socioeconomics, Communities, and Environmental Justice</b></p>
L007-35	<p><u>Comment:</u> Impact SO#10 identifies residential displacements for each alternative alignment. On the Hanford West Bypass Alignment Alternative option, the RDEIR has not evaluated the impacts on proposed residential development. The alignment proposed bisects an area of Hanford that is designated in the General Plan as residential use. There are approved projects that will be impacted by the proposed alignment that are under development agreements with the City. No identification or mitigations are proposed for these developments. As the HST will provide significant impact to already approved projects, the RDEIR needs to evaluate these impacts and mitigate them appropriately.</p>
L007-36	<p><u>Comment:</u> The RDEIR fails to analyze the potential impacts to the City if the City's Amtrak station is closed as a result of the HST's operations. Amtrak service is utilized by a different socioeconomic base than the proposed business plan identifies for the HST, and the RDEIR fails to analyze the impact to such individuals if Amtrak service is no longer available in the City.</p> <p>Amtrak service through the Central Valley provides economic and aesthetic benefits to the smaller agencies and their constituents. The City has, for example, worked with outside organizations, such as the Hanford Conference and Visitor Agency, to develop a program that attracts thousands of visitors to the City each year. Many visitors, including school children on field trips, ride Amtrak trains to the City from nearby communities and tour the City's downtown district. Riding an Amtrak train to the City is an important part of the tour program that the City has worked to develop. The introduction of any HST through the Hanford area at the expense</p>

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- L007-36 of Amtrak service loss would be crippling, and the RDEIR fails to analyze the significant impacts to the City's economy that would result if Amtrak service to the City ceases.
- AB 1779 intends for Amtrak to be removed from Caltrans' control and placed under a JPA's authority. This JPA would be subservient to the HSRA and its business plan. The HSRA Business Plan clearly identifies that the train will serve the Kings/Tulare region and provide transit connections to Kings Area Rural Transit and Tulare County Area Transit. In light of such information, the City fears that Amtrak service to Hanford will cease, which will have a catastrophic impact on the City and its residents.
- L007-37 Comment: The HSR would have significant impact on the existing Amtrak services in addition to the economic impact on the downtown area. The socioeconomic impacts of the HST on the downtown shopping area have not been addressed in the RDEIR. The downtown area generates \$1 million dollars in sales tax revenue which is about 16% of the sales tax portion of the General Fund Revenue. No analysis of impacts of the HST to this downtown retail area has been identified or mitigated in the RDEIR.
- L007-38 Comment: The analysis of short-term employment opportunities is glossed over at best. No analysis is made on whether this would create jobs for existing residents or whether these employees will come from other areas of the State. No analysis is provided to show the impact on housing. For example, if this project creates 22,000 jobs on a short time basis, where and how will they be housed? The report is equally vague about long term employees and their impact on communities such as Hanford. Again, are these jobs for existing residents or will they have to be imported from other areas of the State? What about training programs for existing residents. If, indeed, these jobs are to be filled by outside sources, cities like Hanford will be faced with additional costs for providing services to these new residents.
- Section 3.13 Station Planning, Land Use, and Development**
- L007-39 Comment: The RDEIR/ Supplemental EIS proposes certain temporary or interim improvements to the SR 198/13th Avenue /Hanford-Armona Road interchange in mitigation of the traffic impacts of the Kings-Tulare Regional Station (KTRS) which would potentially be constructed with the Hanford West Bypass HST alternative. If a Hanford West Bypass Alternative HST alignment is ultimately selected by the CHSRA, the City's position is that the traffic impacts of locating the associated KTRS adjacent to the SR 198/ 13th Avenue/ Hanford-Armona Road interchange, as discussed in the RDEIR/Supplemental EIS documents, can only be mitigated by concurrent construction of a completely new interchange.
- The existing SR 198 interchange with 13th Avenue and Hanford-Armona Road, constructed in the mid-nineteen sixties, comprises an atypical convergence of skewed highway and road alignments. The street and highway intersection elements of the interchange are signage-controlled only. Increased traffic volumes associated with normal population increase and urban development within Kings County has impacted the already limited capacity of the interchange. According to the 2008 SR 198 Corridor System Management Plan, adopted by Caltrans and the respective Kings County and Tulare County Associations of Governments, the Target Date for replacement of the interchange (without the CHSR Project) is 2025. However, construction of the Initial Operating Section (IOS) of the CHSR Project on the Hanford West Bypass Alignment by the year 2022, as stated in the Construction Plan portion of the RDEIR/ Supplemental EIS, together with construction of the KTRS on 13th Avenue adjacent to the existing SR 198 interchange, would almost certainly create traffic impacts sufficient to require concurrent construction of a completely new interchange in mitigation.

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- L007-40 Additionally, Caltrans has for a number of years, included language in development project response letters to local agencies requiring temporary mitigation measures to offset traffic impacts on the existing SR 198/13th Avenue/Hanford-Armona Road interchange, in the interim until a permanent interchange can be funded and constructed. In basic terms, these SR 198/ 13th Avenue/ Hanford-Armona Road Interim Mitigation Measures (IMM's) would consist of installation of traffic signals, and construction of temporary pavement widening improvements and lane modifications, similar to the interchange mitigation improvements discussed in the HST DEIR/Supplemental EIS. However, the City has in recent years been collecting proportionate-share contributions toward the estimated total cost of the IMM's from various commercial and residential developers in proportion to their project traffic impacts on the interchange, as the development projects have gone forward. In effect the interchange impact mitigation improvements discussed in the RDEIR/ Supplemental EIS have already been paid for in part by previous projects within the City. These cash contributions have been deposited in a trust fund, for future disbursement to Caltrans at such time as it is determined that the interchange IMM's must be installed. Finally, there are a number of approved Vesting Tentative Tract residential development projects located south of SR 198, between 12th and 13th Avenues within the City's General Plan Area which will be required to make proportionate contributions to the IMM's when they are developed: Tentative Tract Nos. 865, 874, 876, 881, and 902, altogether a total of 770 single-family residential lots. It should be noted that the developers of these projects possess vested rights under California State law to proceed with development in accordance with their conditions of approval.
- L007-41 Comment: The Revised DEIR needs to evaluate both existing land uses in the Hanford as well as those proposed by the City's General Plan. This is particularly true for residential projects such as the Live Oak project, which has been already been approved by the City with negotiated "Development Agreements". Impacts need to be addressed and discussed with the City.
- L007-42 Comment: The concept of a possible station stop in the Hanford area has been glossed over with no analysis of its impact on adjacent land uses. Further, the suggestion that this station stop would not have a TOD development does not adequately address the issue. Just building a station stop with no adjacent urban uses is completely illogical. Why, for example, would not the location of a station stop in either Bakersfield or Fresno allegedly increase demand for urban development at a more intense use be a factor in the types of land uses that would want to locate in a station stop in the Hanford area? I suspect that this type of infrastructure would have a similar impact as was evidenced by the historical development of our freeway system in CA (i.e. urban land uses wanted to develop along those freeways once they were created). It would seem that a new station site in the Hanford area would be growth inducing, particularly to the immediate area surrounding the new station.
- L007-43 Comment: It should be noted that the DEIR quotes the Kings Co. RTP states that "private and public transportation facilities shall be planned and developed consistent with overall growth and development policies contained in City and County general plans". The analysis provided in this document seems to overlook this important consideration. Again, in terms of the County's general plan, the emphasis is on protection of agricultural lands. It is hard to see how the potential siting of a station stop in an area surrounded by agricultural use would be compatible, particularly in terms of pressure to develop urban uses around the station.

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**Section 3.14 Agricultural Lands**

L007-44 | Comment: The report does look at specific conversion of agricultural lands but does not adequately evaluate the impact of this proposed facility on adjacent lands (i.e. growth-inducing). We are all familiar with the impact of freeways on land uses along those freeways. How does the DEIR reconcile the State's agricultural policies that state;

- State policy is to avoid locating federal, state or local public improvements on lands in agricultural preserves and on lands under the Williamson Act contracts.
- State policy is to avoid locating federal, state, or local public improvements of public utilities and the acquisition of lands in agricultural preserves.

**Section 3.16 Aesthetics and Visual Resources**

L007-45 | Comment: AVR-Mitigation Measures. In general, the mitigation measures provide for programs and installations that at maturity are assumed to provide adequate visual and aesthetic mitigation. The concern is near term mitigations that address visual impacts. Trees that are planted to provide visual breaks will not be mature for 10-15 years. What is the proposed mitigation for near term visual impacts?

The graffiti abatement identified in AVR-MM32f states that graffiti or defacement of the structures/facilities will be painted over or repaired within a reasonable time after notification. What determines a reasonable time? The City adopted a policy of 24 hours after notification in order to abate the graffiti quickly to deter future violations. Studies have shown that leaving graffiti for long periods of time attracts additional defacement. Timeframes and mitigation measures need to be specific not general with regards to visual impacts.

**Appendices**

L007-46 | Comment: The TIS for the Revised Fresno to Bakersfield HST RDEIR discusses mitigation of the traffic impacts of a Kings/Tulare Regional HST Station to be constructed west of the City and adjacent to the SR 198/13th Avenue interchange, essentially by construction of the SR 198/13th Avenue IMM's referenced above. It is the City's position that the traffic impacts of construction of the Regional HST Station at this location can only be mitigated by construction of a completely new SR 198 /13th Avenue interchange. According to the 2008 Corridor System Management Plan, endorsed both by Caltrans and the Kings County Association of Governments, the Lemoore-Hanford segment of SR 198 is projected to reach Level of Service (LOS) "F" between the years 2020 and 2030. This LOS "F" projection was made prior to conception of the Hanford West Bypass Alternative HST alignment. If the Kings/ Tulare Regional HST station were to be located as discussed, and if construction of the regional HST system were to be completed within a few years of 2030 as projected, the resulting traffic impacts would be so significant as to clearly require concurrent construction of an entirely new interchange at 13th Avenue and SR 198. Analysis of the foregoing scenario is lacking in the Traffic Impact Study for the Revised RDEIR, and must be addressed in the final environmental documents for the HST project.

- 13th Avenue is designated as an Arterial Street in the City's General Plan, and is therefore planned as a 4-lane Divided Arterial at ultimate development. Yet, in discussing the transportation and traffic impacts of the West HST alignment, combined with the potential

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L007-46 |

location of the Kings/ Tulare Regional Station-West alternative adjacent to 13th Avenue and the interchange with SR 198, the project Traffic Impact Study (TIS) assumes continuation of 13th Avenue as only a 2-lane facility. Installation of traffic signals to accommodate only the current existing two-lane width of 13th Avenue, as proposed in the TIS, would be short-sighted and wasteful in the extreme.

L007-47 |

Comment: The Hume Avenue Alignment, a planned Major Collector Street in the Transportation/Circulation Element of the City's General Plan, is not depicted in the Volume III Section C - Roadway and Grade Separation Plans portion of the DEIR/Supplemental EIS. If a Hanford West Bypass HST Alignment is adopted, a street crossing structure built to Major Collector width standards would be needed at Hume Avenue in order to comply with the City's General Plan for future development in the vicinity of the HST alignment.

L007-48 |

Comment: If Below Grade HST West alignment alternative is ultimately selected, the Below Grade profile should be extended south of Houston Avenue before transitioning to surface grade. This would avoid unnecessary noise and visual impacts to planned residential development of the adjacent area designated by the City's General Plan

**Impact SO #10-Residential Displacements**

L007-49 |

Comment: The text of the first paragraph on Pg. 3.12-79, continued from Pg. 3.12-78, indicates that City services are made available to an existing rural residential subdivision located near Ponderosa Road and Edna Way, in the unincorporated area of Kings County east of Hanford. The text is in error and should be corrected. In fact, City services are not available to the subject residential development. Because comments from homeowners in the subject rural residential subdivision were an important factor in bringing about the Hanford West Alternative Alignment option, all statements regarding the subdivision should be accurate.

As presented in the Draft RDEIR, the analysis of the Project fails to identify critical impacts to the community, and the mitigation measures are inadequate to ensure that significant effects are mitigated to less than significant levels. Because a reasoned response to our comments would require the presentation of new information which identifies significant impacts not disclosed in the draft document, we request that the RDEIR be re-circulated.

This project also faces a number of legal challenges that could potentially delay its construction for years. Any of these actions could interrupt the issuance of the bonds and/or land acquisition and delay the start of construction, threatening the Authority's ability to complete the Central Valley section by the federally imposed deadline of September 2017. These include:

- A major lawsuit asserting that the project as proposed and approved by the Legislature does not comply with various provisions of Proposition 1A. (*Jon Tos, Aaron Fukuda and County of Kings v. California High Speed Rail Authority*).
- A lawsuit filed by the Madera County, Chowchilla Water District, the Madera and Merced County Farm Bureaus, the agricultural organization Preserve Our Heritage, and the Fagundes Dairy asking for a preliminary injunction to block rail construction between Merced and Fresno and reverse the Authority's approval of that segment's EIR.
- Several lawsuits challenging the Program level EIR for the Bay-Area-to Central Valley section of the statewide project. A victory by the challengers of the Program EIR would invalidate any project level EIRs in the Central Valley.

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- Potential environmental lawsuits charging the HSR project with violations of the state environmental law (CEQA) and the Endangered Species Act.
- The possibility of a legal challenge that Proposition 1A money is being used "unlawfully," for non-HSR projects in the "bookend" areas.

City staff is available to review any of the comments provided in this letter, or to assist the Authority in analyzing impacts and devising appropriate mitigation measures where feasible. Please send a written response to our comments prior to any action on the environmental document. You may contact me at (559) 585-2583 or via email at [mhaigh@ci.hanford.ca.us](mailto:mhaigh@ci.hanford.ca.us) with any questions or to request a meeting to discuss these comments in greater detail.

Sincerely,

COMMUNITY DEVELOPMENT DEPARTMENT



Melody N. Haigh  
Community Development Manager

CC: **City Staff**  
Pamela A. McCarthy, City Manager  
Robert Dowd, City Attorney  
Ty Mizote, City Attorney  
Lou Camara, Public Works Director  
John Doyel, Deputy Public Works Director  
Tim Ieronimo, Fire Chief  
Carlos Mestas, Police Chief

**Council Members**  
District A – Jim Irwin  
District B – Sue Sorenson  
District C – Dan Chin  
District D – Lou Martinez  
District E – Joleen Jameson

Attachments: October 13, 2011 Response to Fresno to Bakersfield Draft EIR/EIS



October 13, 2011

Fresno to Bakersfield Draft EIR/EIS Comment  
California High Speed Rail Authority  
770 L St., Suite 800  
Sacramento, CA 95814

On September 20, 2011, the City of Hanford City Council approved sending a letter to the CAHSRA to request that the review period for the EIR/EIS be extended to six (6) months. This request was in addition to others that have been sent. To date, no extension has been reported.

It should be noted that the burden of reviewing and commenting on the Draft EIR/EIS within the designated comment period is unreasonable and disproportionate to small agencies with limited staff, such as Hanford. Volume 1 of the Draft EIR/EIS tends to contain summary information with references to thousands of additional pages of text and graphics in separate documents, some of which are included as appendices and some are not. While we remain concerned that the methodology and approach utilized to prepare the EIR/EIS is inadequate to fully disclose impacts to the Hanford and Kings County community, it has not been possible to develop a complete understanding of how the technical studies and supporting documents were utilized to reach the conclusions presented in the EIR/EIS. This dilemma is magnified by the fact that an already small staff typical of medium and small cities like Hanford has been reduced further due to economic conditions. We believe that the additional analysis requested in some of the comments below is sufficiently extensive enough to require a revised Draft EIR/EIS be issued. The revised Draft EIR/EIS, when completed, should be circulated for at least a 6-month period. Our comments are below.

We would like to request that, in addition to the "project" and "no project" scenarios, analysis of an alternative alignment along the SR 99 corridor be included in the final EIR/EIS.

The HST is considered the single most significant project in California history. The environmental review process should reflect its importance, particularly for all of those that will be affected by its design. Further, Section 15064 of the CEQA Guidelines advises EIR preparers when evaluating impacts that "The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting. For example, an activity which may not be significant in an urban area may be significant in a rural area." The EIR/EIS provides extensive analysis in the urban settings of Fresno and Bakersfield. However, there is a lack of information and analysis in the rural areas of Kings County. This leads to an inappropriate conclusion of "no significant impact" for many sections. This is a major inadequacy of the EIR/EIS.

\* COMMUNITY DEVELOPMENT: 559-585-2580 • FACSIMILE: 559-583-1633

Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

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**Section 1.0 – Project Purpose, Need, and Objectives**

• Section 1.3.1

This section references the San Joaquin Valley Blueprint process, an unprecedented planning effort that was launched in 2005 by the eight valley metropolitan planning organizations. It should be noted that, in addition to the valley-wide effort, each of the individual eight counties undertook county-specific Blueprint processes that outlined goals, priorities, and smart growth planning objectives. There are planning principles specific to the Kings County Blueprint that were outlined during the county-specific public outreach efforts. The eight county-specific Blueprints provide a more detailed look at each county's planning priorities. The Kings County Blueprint Principles should be evaluated and integrated into the EIR/EIS.

**Section 2.5 – Travel Demand and Ridership Forecast**

• Pages 2-87 thru 92

Since Hanford is listed as a potential station location, there is a need to include ridership forecasts for Hanford with a station, and Hanford without a station.

We believe the document should include a list of ridership costs for roundtrip tickets from various stops in the Valley, as well as the cost of tickets to the Bay Area, Los Angeles and Sacramento.

**Section 3.2 - Transportation**

- Page 3.2-15 "Passenger Rail Service". This section indicates that Amtrak's San Joaquin route runs several times a day between the San Francisco Bay area, Sacramento, and Bakersfield, and notes that other stops include Stockton, Modesto, Merced, Martinez, and Fresno. It does not mention Hanford or Corcoran.

- Comment: Since Hanford's ridership exceeds Stockton, Modesto, and Merced, it should certainly be listed as a stop.

- Page 3.2-24 (figure 3.2-9) "Roadway Classifications" draft EIR identifies Lacey Boulevard as a local street. Other areas of document identify Lacey Boulevard as an arterial street (see Transportation-Technical Analysis Report page 4.3.2).

Comment: Both City of Hanford roadway segments of Grangeville Boulevard from 10<sup>th</sup> Avenue to Highway 43 and Lacey Boulevard from 10<sup>th</sup> Avenue to Highway 43 will be impacted with the project. These two segments of roadway need to be included in the Traffic Impact Study Analysis. Both roadways are designated as city arterial streets.

- Page 3.2-48

Draft EIR states that with the introduction of HST service, passenger rail service (Amtrak) could be discontinued at Hanford, Corcoran, and Wasco.

Comment: Abandoning Amtrak service at the existing Hanford downtown station would severely impact our local economy and limit transportation options within our community and Kings County in general. The City of Hanford and Kings Area Rural Transit (KART) have invested approximately \$3 million to develop a regional transportation facility in the

Page 3

Downtown area. KART provides local and regional bus service in Kings County. It connects with Amtrak San Joaquin trains, Visalia City Coach, and Fresno Area Express. The hub of the bus system is Hanford Station.

The impact of moving a train station approximately 1.5 miles east of town, or worse, not having a station to serve our community, would be devastating. The draft EIR does not identify mitigation measures to address this issue. The Hanford Station has more Amtrak ridership than Modesto, Stockton, and Merced – all larger cities. According to statistics provided by the Hanford Visitor Agency, 98 organized groups were processed in the fiscal year 2010-11 (ending in July, 2011). Of these groups, 45% of the visitors came on Amtrak. This does not count other groups or individuals that do not use the Visitor Agency services. A conservative estimate would be an additional 20 visitors per day, or 7,280 per year. If the 45% using Amtrak holds true, that would be an additional 3,276 visitors per year using Amtrak, for a total visitor count of 6,164. This also does not include those people who use Amtrak to commute to and from work and those traveling on vacation or business. It is estimated that the average ridership at the Hanford Station is 7,500 to 9,000 people per month. Hanford is the third busiest stop on the San Joaquin line. The loss of a station in Hanford would mean a yearly loss of 90,000+ Amtrak riders. At an average ticket price of \$50, this would mean a loss of \$4,500,000 yearly. If the average ticket cost of \$100 is used, it would be a loss of \$9,000,000 yearly. Add in the loss of revenue from hotel rooms, food, gas, rental cars, and merchandise, and the yearly loss is considerably more. The EIR-EIS indicates that existing riders would shift to HST service as it becomes available. Based on existing Amtrak ticket prices and the estimated cost of HST, it is unlikely that most riders would shift. It would mean an increase in vehicle miles traveled if (most likely) people shift to using personal vehicles, but many of the city's visitors would be lost. Also, there is only a "potential" HST station in Hanford. If there is no Amtrak station and no HST station, there would definitely be an impact to vehicle miles traveled.

The EIR-EIS states that there would be a negligible impact under NEPA and a less-than-significant impact under CEQA because existing passenger rail service would not be limited or worsened as the HST maintains service between major cities on the San Joaquin route. However, since Hanford is the third busiest stop on the San Joaquin route, it is one of the major cities. The loss of an Amtrak station in Hanford is certainly significant. The financial/economic impacts must be addressed in the EIR-EIS and be discussed under Transportation and Environmental Justice. There should also be a review of the impacts of Vehicle Miles Traveled, including GHG, because train users would be required to drive to Fresno or Bakersfield to access Amtrak should Hanford's station be discontinued. There should also be an analysis of the economic impact of no commuter rail service and the effect that would have on people who rely on Amtrak to commute to their jobs.

- Page 3.2-63

Draft EIR mentions that primary access to the proposed HST station will be via a direct access connection to Highway 43 located between the San Joaquin Valley Railroad (SJVR) and the intersection of Highway 43/Grangeville Boulevard.

Figure 2.4 Transportation Analysis Technical Report also shows a map identifying a direct access connection to Highway 43.

Comment: Caltrans will not allow a direct access connection to their highway system. Access to proposed HST station facility, in its current location, will most likely be required off Grangeville Boulevard.

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Another possible option is locating the HST station south of the SJVR tracks. This would allow a connection to serve the facility off of Lacey Boulevard. Either location would require an updated Traffic Impact Study (TIS) analysis.

- Table 3.2-18, page 3.2-63

Draft EIR states that the segment of Highway 43 from Highway 198 to Grangeville Boulevard will be adversely impacted with development of an HST station. Mitigation measures as identified on Table 3.2-32, page 3.2-91, specify construction of an additional travel lane on Highway 43. Since this segment of roadway crosses the SJVR track line, construction of an over/underpass at the crossing may be required. The future Caltrans Highway 43 expressway plan specifies the need to install a grade separation structure at the SJVR crossing if road widening occurs.

- Table 3.2-19, page 3.2-64

Draft EIR states that the intersection of Highway 43/Lacey Boulevard will be adversely impacted with development of an HST station. Mitigation measures as identified in Table 3.2-31 specify installation of a traffic signal system to improve LOS/operation. TIS fails to address the issue of the Highway 43/Lacey Boulevard intersection being in close proximity to the Highway 198 westbound off ramp. Caltrans has stated to City staff that relocation of the Highway 43/Lacey Boulevard intersection further north from the existing location will be necessary in the future to accommodate left turn movements onto Lacey Boulevard. Maintaining this movement is critical to providing access to existing/future businesses located along East Lacey Boulevard as well as the City Downtown. Mitigation measures need to address this issue and provide for relocation of the Lacey Boulevard/Highway 43 intersection north of its current location. City staff is available to discuss this issue in more detail.

- Page 3.2-65

Draft EIR discusses the possibility of funding construction of some downtown parking facilities to reduce the development footprint at the proposed HST station. The EIR/EIS needs to elaborate more on this issue and be specific. How many spaces are proposed to be offset with mitigation dollars? When would funding become available? Where would the off-site parking be located and how many spaces would be there be? How many on-site spaces are planned? What are the traffic impacts of travel into Hanford to access this parking?

- Page 3.2-66

Draft EIR makes reference to "Fresno station area" in paragraph titled "Kings/Tulare Area Freight Impacts." This statement is incorrect.

- Page 3.2-90, Table 3.2-32

Draft EIR refers to Highway 198 as a two-lane roadway throughout the document. Improvements to widen Highway 198 from Hanford to Visalia from two to four lanes have been on-going for well over a year now and are anticipated to be completed in 2012.

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**Section 3.4 - Noise**

- There is no detail in the Draft EIR/EIS that quantifies the total exposure of noise to sensitive receptors. While the Ldn for residential is provided, it lacks meaning and clarity given the extent of the proposed HST operations. There is no analysis of the period of time that the increasing, peak, and decreasing noise from the train will be experienced during the daily operations throughout Kings County.
- The noise and vibration impacts upon the rural and agricultural areas (including dairy operations) of Kings County have not been adequately addressed in the Draft EIR/EIS. It is important to note that the level of significance for noise and vibration impacts in agricultural and rural areas should be considered differently than the level of significance recognized in metropolitan or urban areas where higher noise and vibration levels can be expected. The agricultural and rural areas of Kings County are significantly more susceptible to changes in noise and vibration levels, since existing conditions involve minimal noise and vibration disturbances. Please note that a significant effect on the environment as defined in the CEQA guidelines includes potentially substantial adverse change in physical conditions. Regarding noise and vibration, adverse changes relating to noise and vibration in agricultural and rural areas should be examined separately from those impacts in urban areas. While there was information on noise levels for livestock, it was not clear what the impacts would be and how the impacts would be mitigated.
- The Draft EIR/EIS does not propose any sound barriers as mitigation in the Hanford area. Why?

**Section 3.11 – Public Safety and Security**

As stated in the Draft EIR/EIS, the United States currently doesn't have any standards for a High Speed Rail system. The Authority should place the EIR/EIS and the project on hold and begin the process of adopting standards. It is unrealistic and inadequate to simply rely upon another nation's protocol.

- Table 3.11.3 on Page 3.11-8 is incorrect in the listing of Hanford Fire Department's equipment. The current Fire Department Apparatus listing is as follows:
  - 4 engines – 2 staffed
  - 2 patrols – staffed when staffing is available
  - 1 hazmat apparatus
  - 1 command vehicle (Police and Fire)
- Page 3.11-15 – Law Enforcement – does not list crime rates for Hanford or Kings County. This needs to be included in the analysis.
- Current Police Vehicles
  - 18 marked patrol vehicles
  - 6 unmarked vehicles
  - 1 marked pick-up
  - 2 marked Citizen on Patrol vehicles
  - 1 armored vehicle
  - 1 police/fire mobile command vehicle
  - 3 traffic motorcycles
  - 1 SWAT Equipment Transport Van

Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

Page 6

- Emergency Response Plans

Figure 3.11-4 on Page 3.11-11 does not correctly identify hospital locations in Hanford. While there is a small complex on North Douty (Central Valley), this facility does not provide emergency treatment. The primary hospital (Adventist Medical Center) is at Mall Drive and Seventh Street and does provide emergency treatment. There is a heliport at that location.

Figure 3.11-4 also does not show Fire Station #2, which is located on Houston near 11<sup>th</sup> Avenue. It does show a police or fire station to the west of town, which should probably have been identified as the hospital (Adventist Medical Center).

**Section 3.11.7 – Mitigation Measures**

- Page 3.11-38

MM#2 indicates that payment of impact fees would lower impacts of safety and security hazards.

- Table 3.11-8 on Page 3.11-39 also indicates payment of impact fees would lower a "significant" impact to "less than significant".

Comment

Impact fees alone will not mitigate or lower impacts to a less than significant level and we believe that further analysis is warranted. Suggested mitigation measures are:

1. There will be a need to construct a fire station and a police substation on the east side to maintain current response times.
2. Additional staff to meet the demands for growth – per National Standards for Fire Fighters and one per thousand as per City Council policy for Police Officers.
3. Additional Fire apparatus, such as a ladder truck, and Police vehicles as required.
4. Additional radio equipment.
5. Special equipment for accidents.

**Section 3.13 – Land Use**

- The proposed station site is outside the City's Sphere of Influence (SOI) and is not eligible for annexation. County policies direct development to the cities within the County. The County's General Plan shows the area as agricultural, which it has been for a very long time. The City has not identified a General Plan land use designation, since it's outside the SOI. The State's guidelines call for Transit Oriented Development (TOD) around the station, which would not be appropriate in the current proposed location. Although we have been told that the Kings-Tulare Regional Station would not be required to provide TOD, there is nothing in the EIR/EIS that would exclude the Hanford area station from this requirement. We would like an acknowledgment in this document that the Hanford area station would not be developed the same as stations in urban areas and that the area would be allowed to remain in agriculture, with possibly an Urban Reserve designation for the future.

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The Draft EIR/EIS has indicated that the impact to Land Use by the HST is less than significant and no mitigation is required. This is not plausible. The EIR/EIS has stated that the station locations will result in increased development around them and that will have an impact. Development around the Hanford area station would be detrimental to the agricultural area, as well as to Hanford's historic downtown. It is not appropriate to simply dismiss the growth inducing impact of the facility by stating the impact would be less than significant. We strongly request the Authority to do the necessary analysis to determine the growth inducing impacts of the HST and disclose them within the Draft EIR/EIS.

- How much land would be removed from agriculture within Kings County, both for right-of-way and because of creating unusable parcels?

Some general questions, not necessarily covered in any specific section of the EIR-EIS are:

- Could there be a problem with any potential contaminants in the fill used during construction? What are the negative repercussions if any contaminants or pests are brought in? How could this negatively impact the fertile valley soil? What are other potential problems that could be caused from the fill?
- Will the upcoming financial plan have more analysis on the number of jobs created? CAHSRA has claimed that 20,000 jobs will be created for every \$1 billion spent on the project per year. Since it's estimated that \$5.5 billion will be spent for the rail between Fresno and Bakersfield, has it been confirmed that 20,000 jobs will be created in the Valley for five and a half years – or longer?

The City of Hanford appreciates the opportunity to review and comment on the Draft EIR/EIS for the Fresno to Bakersfield section of the California High Speed Rail project. We recognize the tremendous scope of the project and the difficulty in attempting to analyze and address all potential impacts. However, even in the short period of time allowed for review of the voluminous document, we have noted quite a few inadequacies.

As presented in the Draft EIR/EIS, the City of Hanford believes that the analysis of the Project fails to identify critical impacts to the community. We also believe that mitigation measures are not adequate to ensure that significant effects are mitigated to less than significant levels. Because a reasoned response to our comments would require the presentation of new information which identifies significant impacts not disclosed in the draft document, we request that the Draft EIR/EIS be re-circulated.

City staff is available to review any of the comments provided in this letter, or to assist the Authority in analyzing impacts and devising appropriate mitigation measures where feasible. Please send a written response to our comments prior to any action on the environmental document. You may contact me at (559) 585-2578 or via email at [ccain@ci.hanford.ca.us](mailto:ccain@ci.hanford.ca.us) with any questions or to request a meeting to discuss these comments in greater detail.

Sincerely,

COMMUNITY DEVELOPMENT DEPARTMENT



Cathy Cain  
Interim Community Development Director

Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued



## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012)

### L007-1

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-10.

The Authority conducted an analysis of alternative alignments that follow State Route (SR) 99/the Union Pacific Railroad (UPRR) and the Interstate 5 (I-5) corridor and determined that these alternatives were not practicable. Therefore, they were not carried forward in the EIR/EIS. Kings County has not provided any new information that would change these conclusions. Neither the California Environmental Quality Act (CEQA) nor the National Environmental Policy Act (NEPA) requires an environmental document to analyze impacts that are not practicable to implement.

In the case of Hanford, it was not feasible to follow the BNSF Railway (BNSF) corridor through the city. The BNSF corridor in the Hanford area has several curves that are too severe for an HST alignment, and constructing the HST project through Hanford would have resulted in a substantial impact on residential and commercial properties in the city. For those reasons, the Preferred Alternative for the Fresno to Bakersfield Section was selected to bypass Hanford in the Statewide Program EIR/EIS for the California High-Speed Rail System (Authority and FRA 2005).

The Authority used the information in the Final EIR/EIS and input from the agencies and public to identify the Preferred Alternative. The decision included consideration of the project purpose, need, and objectives, as presented in Chapter 1, Project Purpose, Need, and Objectives; the objectives and criteria in the alternatives analysis; and the comparative potential for environmental impacts. The Preferred Alternative has the least overall impact on the environment and local communities, the lowest cost, and the fewest constructability constraints of the project alternatives evaluated.

### L007-2

Refer to Standard Response FB-Response-GENERAL-07, FB-Response-GENERAL-08.

The Authority and FRA disagree with the commenter's characterization of the adequacy of the EIR/EIS. The EIR/EIS has been prepared in compliance with CEQA, NEPA, and the related regulatory guidances, including the sections cited by the commenter.

### L007-3

Refer to Standard Response FB-Response-GENERAL-08, FB-Response-LU-03.

Project consistency with the City of Hanford General Plan policies is discussed in Section 3.13.2.4, Section 3.13.5.3, and Appendix 3.13A-1.

Impacts on surrounding land uses are discussed in Section 3.13.5.3. As stated in Section 3.13.5.3, the Hanford West Bypass 1 and Bypass 2 alternatives would not be compatible with adjacent land uses and would be inconsistent with land use plans, policies, and regulations. For these reasons, the land use effects of the Hanford West Bypass 1 and Bypass 2 alternatives would have substantial intensity under NEPA and would result in a significant impact under CEQA.

### L007-4

The shopping area at 12th Avenue and Lacey Boulevard would not be directly or indirectly affected by the project alternatives because none of these properties would be displaced. Impacts on the 12th Avenue and Lacey Boulevard intersection are detailed in the Revised DEIR/Supplemental DEIS, Section 3.2, Transportation, and in Section 3.2-27, where it is shown that the effect would be of negligible intensity under NEPA and would be less than significant under CEQA. Therefore, the project would not affect the ability of this shopping area to meet the regional retail shopping needs.

### L007-5

Impacts on surrounding land uses are discussed in Section 3.13.5.3. As stated in Section 3.13.5.3, given the agricultural land use designations surrounding the station area, the availability of appropriately designated land on the western side of Hanford and in the community of Armona that could be developed, and the Authority's vision for the Kings/Tulare Regional Station–West to act as a transit hub, the potential for indirect effects on land use in the area surrounding the Kings/Tulare Regional Station–West Alternative is high.

Like the Kings/Tulare Regional Station–East Alternative analysis, the analysis for the Kings/Tulare Regional Station–West Alternative assumes that development could occur in the area around the station because use of the station is likely to attract service-oriented development. Lands in this area contain a variety of Urban Reserve lands,

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## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

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### **L007-5**

including residential, commercial, office, and public facility. No high-density land uses are designated. However, most of Hanford's residential land uses are designated low-density, with some medium-density residential uses and a few pockets of high density. Indirect changes to adjacent lands would be a significant impact under CEQA because those changes would substantially change the pattern and intensity of land use in a way that would be incompatible with adjacent land uses.

These indirect land use effects are considered to have substantial intensity under NEPA because they would acquire land, may change adjacent land uses, would result in induced growth, and would be generally inconsistent with applicable plans.

### **L007-6**

As stated in Appendix 2-A, there are no proposed road closures in the Hanford/Armona area from either the Hanford West Bypass 1 or Bypass 2 Alternatives. The project is consistent with Objective C11 of the *City of Hanford General Plan* (City of Hanford 2002).

### **L007-7**

As stated in Appendix 2-A, there are no proposed road closures in the Hanford/Armona Area from either the Hanford West Bypass 1 or Bypass 2 Alternatives, and therefore the project would not eliminate any street crossing or affect pedestrian opportunities. The project is consistent with Objective C18 of the *City of Hanford General Plan* (City of Hanford 2002).

### **L007-8**

Refer to Standard Response FB-Response-GENERAL-03, FB-Response-GENERAL-04.

The HST is a state and federal project and, as such, is not required to be consistent with county general plan objectives and policies. The Kings/Tulare Regional station's inconsistency with existing general plans of Kings County and the City of Hanford is disclosed in the EIR/EIS (see Section 3.13, Station Planning, Land Use, and Development). The growth-inducing effect of the alternative Kings/Tulare Regional station sites is disclosed in Section 3.18, Regional Growth.

### **L007-9**

Refer to Standard Response FB-Response-N&V-05.

Most Noise Elements contained in respective General Plans have similar objectives and policies. These were taken into account as part of the project.

### **L007-10**

Refer to Standard Response FB-Response-GENERAL-03.

### **L007-11**

The HST project is an undertaking of the Authority and FRA, in their capacities as state and federal agencies. As such, it is not required to be consistent with local plans.

The Land Use Element of the Hanford General Plan does not define development, but in reading the plan it is clear that it is intended to apply to commercial, residential, and industrial developments. The proposed project is a public transportation facility, not a new development.

### **L007-12**

Refer to Standard Response FB-Response-GENERAL-08.

### **L007-13**

A level of service (LOS) of F was predicted for SR 198 in the future, with or without the project (Table 3.2-23). The future scenario included projects proposed to be built that would benefit LOS, with or without the HST project, including the proposed Kings/Tulare Regional Station. The analysis showed the volume-to-capacity ratios would be the same with or without the project. This indicates that although the highway may be at capacity in the future, the alternative HST alignments would not noticeably change the condition.

### **L007-14**

For a analysis of all road segments associated with the Kings/Tulare Regional Station-West Alternative, refer to the *Fresno to Bakersfield Transportation Technical Analysis Report* available on the Authority's website. As stated in Section 5.3 Future No-Build

## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

### **L007-14**

(Year 2035) Conditions, Future No-Build traffic demands were projected based on the Counties of Fresno, Kings, and Kern Travel Demand Regional Models. The regional travel demand models included the future transportation improvements that are funded and included in the Regional Transportation Improvement Plans (RTIPs) (RTIP projects are listed in Sections 4.2.5, 4.3.5, and 4.4.5 of this document). Intersection and roadway segment analysis for Future No-Build and Project Conditions was conducted taking into account the transportation improvements included in the RTIPs. A road designation within the General Plan does not provide assurance of construction, unlike RTIP projects.

The California High-Speed Rail Authority will continue to coordinate with the City of Hanford during the procurement stage to agree upon how to accommodate the HST project with the City's future roadway improvement projects, and the required level of roadway improvements associated with the HST project.

The traffic analysis was performed with and without a traffic signal installed at the intersection of 13th Avenue/SR 198. The intersection is predicted to operate at LOS F with or without the project (and no signal). With signals at both the westbound ramp and eastbound ramp, the operations of the intersections are predicted to improve to LOS A (Table 5.5-1, Fresno to Bakersfield Transportation Technical Analysis).

### **L007-15**

Refer to Standard Response FB-Response-GENERAL-08.

Throughout the design and procurement process for the HST project, the Authority will continue to coordinate with the City of Hanford to agree on the required level of roadway improvements for Glendale Avenue.

### **L007-16**

The intersection of 12th Avenue and Lacey Boulevard was analyzed as Intersection ID #11. Refer to the *Fresno to Bakersfield Section: Transportation Analysis Technical Report* (Authority and FRA 2012n) for details on this specific intersection.

### **L007-17**

Figure 3.2-15 does not intend or claim to depict all arterial roadways. The figure exhibits Interstate, State Routes, and Local roads pertinent to the HST project. Study area intersections for the Kings/Tulare Regional Station-West are introduced in Figure 3.2.14, and ID 12 is correctly located at the intersection of 12th Avenue and Mall Drive. The intersection mentioned in the comment, 12th Avenue and Lacey Boulevard, is correctly labeled as ID 11.

### **L007-18**

Refer to Standard Response FB-Response-GENERAL-12, FB-Response-GENERAL-13.

### **L007-19**

As stated in Table 2-A-3, of Appendix 2-A Road Crossings, Grangeville Boulevard (No. 14) would also pass under the HST alignment.

### **L007-20**

On average, roadway overpasses would be provided approximately every 2 miles along the track. It is estimated that the proposed project would result in no more than 1 mile of out-of-direction travel for vehicles to cross the HST tracks. Due to this frequency of roadway overpasses, additional distances traveled by vehicles to cross the HST tracks are expected to be negligible relative to regional vehicle-miles-traveled reductions, and therefore would not cause additional air quality impacts. For more details on roadway overcrossings, see Sections 2.2.4 and 2.2.5 of the Revised DEIR/Supplemental DEIS.

### **L007-21**

Capital costs for each element of the HST, including stations, are described in Section 5.0 Project Costs and Operations. Twenty stations are included in the cost estimate, for the entire HST system. The estimated costs of the stations include land acquisition and site improvement costs to support future development of parking facilities, the construction of which would be phased over future years based on demand.

The Authority would work with local jurisdictions and other interested parties to phase the parking supply to support HST ridership demand and the demand of other uses in

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## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

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### **L007-21**

the vicinity of the station. The stations have not yet been designed (the illustrations in the EIR/EIS are conceptual) and will not be designed for several years. Similarly, actual ridership levels are not known at this time. As discussed in Section 2.2.3 of the Revised DEIR/Supplemental DEIS: "Parking demand expectations are based on HST system ridership forecasts where parking availability is assumed to be unconstrained – meaning 100% of parking demand is assumed to be met. These projections provide a "high" starting point to inform discussions with cities where stations are proposed. While this EIR/EIS identifies locations for parking facilities needed to satisfy the maximum forecast demand, parking is anticipated to be developed over time in phases, while also prioritizing access to the HST system through other modes such as transit, which could lead to less parking being necessary.

### **L007-22**

Refer to Standard Response FB-Response-TR-01.

Measures #1 through #11 in the Revised DEIR/Supplemental DEIS are listed as Project Design Features. They are considered part of the project and its construction, and are not considered mitigation. These would be applied in Hanford as appropriate.

### **L007-23**

The traffic analysis was performed with and without a traffic signal installed at the intersection of 13th Avenue/SR 198. The intersection is predicted to operate at LOS F with or without the project (and no signal). With signals at both the westbound ramp and eastbound ramp, the intersections are predicted to improve to LOS A (Table 5.5-1, Fresno to Bakersfield Transportation Technical Analysis).

As stated in Table 3.2-49, Future (2035) Plus Project Mitigation Measures – Kings/Tulare Regional Station–West Alternative, the HST proposes specific mitigation to install a traffic signal at the intersection at Hanford-Armona Rd and 13th Avenue. The share of traffic associated with the project was not determined to be substantial enough to warrant the construction of an interchange. If the City of Hanford decides to construct an interchange at this location, the funds provided by the Authority for the above mentioned intersection, could be applied to that project, as the intersection would no longer exist.

### **L007-24**

The California High-Speed Rail Authority will continue to coordinate with the City of Hanford during the procurement stage to agree upon the required level of roadway improvements for Hume Ave. associated with the HST project (Hume Ave. does not extend west of 12th Avenue, and does not cross the proposed alignment). The Hanford West Bypass alignment is near 13th Avenue. Extending the below-grade profile near residential development can provide noise and visual mitigation, but at a very high cost, and may require a wider right-of-way to accommodate sloped embankments.

### **L007-25**

Refer to Standard Response FB-Response-AQ-01.

### **L007-26**

Refer to Standard Response FB-Response-N&V-05.

### **L007-27**

Refer to Standard Response FB-Response-PU&E-03, FB-Response-HWR-01.

The Authority and its contractors are actively assimilating information on existing and planned utilities. The designs presented in the Revised DEIR/Supplemental DEIS are based on preliminary engineering. The Authority and its contractors will coordinate with utility owners to refine this information to ensure all known facilities within the footprint are properly considered during future design phases. The Authority and its contractors would positively locate public utilities within the potential impact area (by probing, potholing, electronic detection, as-built designs, or through other means) prior to construction, in compliance with state law (i.e., California Government Code 4216). Where it is not possible to avoid utilities, they would be improved (e.g., steel pipe encasement) so that there is no damage or impairment to the operation of these utilities from the proposed project. All site-specific information available at the time of preliminary design, including water systems information, has been shared with the project engineers so that the designers can address utility relocations and retrofits in the HST design plans and cost estimates. Refer to Section 3.6.5.

The Revised DEIR/Supplemental DEIS provides information about project impacts on

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## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

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### **L007-27**

public utilities and energy (refer to Section 3.6.5). Additionally, the discussion in the Conflicts with Existing Utilities subsection provides information on what the Authority would do to relocate utilities or protect them in place. Project cost estimates include the estimated cost of utility relocations. These costs will be refined as the project design progresses.

### **L007-28**

Refer to Standard Response FB-Response-PU&E-01, FB-Response-PU&E-03.

The Authority is actively assimilating information on existing and planned utilities. The designs presented in the Revised DEIR/Supplemental DEIS are based on preliminary engineering. The project team has been coordinating and will continue to actively coordinate with utility providers during all the design phases of the project to identify, describe, and evaluate the HST's potential impact on infrastructure. As appropriate and commensurate to the early stage of engineering design, modifications have been made to the Revised DEIR/Supplemental DEIS to reflect the comments provided (see Section 3.6.2, Laws, Regulations, and Orders). Where the project would require modification of any electrical substation or electrical transmission, power, or distribution line, such modifications would be conducted in compliance with the California Public Utilities Commission's General Order 131-D. The Authority will assist utility providers in applying for a permit from the CPUC under CPUC General Order 131-D, including the need for any additional environmental review necessary for transmission line relocation or extension, or other new or modified facilities, and any localized increase in electrical loads identified as part of the more detailed design.

### **L007-29**

Refer to Standard Response FB-Response-HWR-02, FB-Response-PU&E-03.

The HST may conflict with existing stormwater retention ponds and basins. However, the Authority will replace any stormwater basin capacity lost through HST construction. Preliminary engineering has confirmed the feasibility of either avoiding impacts on existing stormwater basins, or relocating the stormwater basins within the HST construction footprint. If utilities cannot be relocated or modified within the construction footprint, additional environmental analysis will be conducted, if necessary. Refer to

### **L007-29**

Section 3.6.5.3 for more information.

### **L007-30**

As stated in Section 3.7.5.3, the Hanford West Bypass Alternative would result in slightly more temporary direct impacts on natural habitats suitable for special-status wildlife species. Permanent impacts associated with the project period would occur as described in Section 3.7.5.3 and as presented in Appendix 3.7-B, Attachment 2.

As described in Section 4 (Section 4(f) and 6(f)) of the Revised DEIR/Supplemental DEIS, a preliminary avoidance alternative was developed to minimize impact to 4(f) resources. The Final EIR/Final EIS incorporates more detailed design and these minor adjustments have been incorporated into the Hanford West Bypass 2-Modified Alternative and changes have been incorporated into the construction and project impact assessment (quantity of impacts). No new biological impacts or resources are identified in the Hanford West Bypass 2-Modified Alternative.

Details regarding the natural resource present in the study area are provided throughout Section 3.7.4 (Affected Environment), and available in Appendix 3.7-A, Attachment 1 (Figure A-3 Observed Habitats within the Habitat Study Area Wildlife habitat) and the corresponding habitats for special-status species in Attachments 1 and 2 of the Final EIR/Final EIS.

As presented in Appendix 3.7-B, the natural habitats present in the Hanford West Bypass 1 and 2-Modified alternatives study area may potentially contain elderberry shrubs. As stated in Bio-MM#21, preconstruction protocol-level surveys would be conducted for valley elderberry longhorn beetle, and buffers would be created around elderberry shrubs during construction. Bio-MM#55 will be implemented to provide transplantation and replacement of elderberry shrubs, following the USFWS'

## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

### L007-30

Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS 1999a).

Lone Oak Slough was identified during wetland delineation surveys, and impacts to the riverine and riparian areas associated with this feature are included within the impact analysis (during construction and project) and will be mitigated for as described in Bio-MM#62 and Bio-MM#63.

### L007-31

Refer to Standard Response FB-Response-HWR-04, FB-Response-GENERAL-01.

Impact HWQ#3 and Impact HWQ#7 in Section 3.8, Hydrology and Water Resources, discusses potential impacts of the HST project on groundwater. The Lines of Equal Depth to Water in Wells maps developed by the Department of Water Resources for Spring 2010 show water depths of 100 feet near Hanford. It is not anticipated that any excavations in the Hanford area would be sufficiently deep to interact with groundwater. If groundwater is encountered during construction, it would be removed and disposed of according to the requirements of the National Pollutant Discharge Elimination System (NPDES) permit. The volume of groundwater removed would be minor, as it would consist only of seepage.

### L007-32

The entire HST right-of-way would be fenced to prevent access. Fencing would typically consist of a 7-foot-high, galvanized steel mesh or chain-link fence with 1 foot of 3-strand barbed wire on top. Fencing would be electronically monitored and regularly inspected by Authority maintenance staff. Maintenance of the fence would be the responsibility of the Authority.

### L007-33

As described in Mitigation Measure S&S-1 in Section 3.11, the Authority will monitor response of local fire, rescue, and emergency service providers to incidents at stations and the HMF and provide a fair share of cost of service. Prior to operation of the stations

### L007-33

for HST service, the Authority will enter into an agreement with the public service providers of fire, police, and emergency services to fund the Authority's fair share of services above the average baseline service demand level for the station and HMF service areas (as established during the monitoring period). The fair share will be based on projected passenger use for the first year of operations, with a growth factor for the first 5 years of operation. To make sure that services are made available, impact fees will not constitute the sole funding mechanism, although impact fees may be used to fund capital improvements or fixtures (i.e., police substation, additional fire vehicle, onsite defibrillators) necessary to service delivery. After the first 5 years of operation, the Authority will enter into a new or revised agreement with the public service providers of fire, police, and emergency services to fund the Authority's fair share of services. The fair share will take into account the volume of ridership, past record and trends in service demand at the stations and HMF site, new local revenues derived from station area development, and any services that the Authority may be providing at the station.

### L007-34

The HST right-of-way would be fenced to prevent access. That fencing would be electronically monitored and visually monitored on a regular basis by maintenance staff. Trains would not be parked at the Kings/Tulare Regional Station. Where trains are parked on the system, they would be in a secure area.

The Authority would be responsible for maintaining system facilities which would include cleaning off graffiti on those facilities if vandalism were to occur.

The Authority would provide security personnel at the stations or contract that service with local providers.

The Authority is unaware of any data that would indicate that HST facilities would be magnets for the homeless. The homeless would not be able to access the right-of-way and would not be allowed to camp or loiter at the stations. The Kings/Tulare Regional Station alternatives are located in areas of Hanford with limited urban development, usually an indication of low-homeless populations, so the Authority would not anticipate the station to become a place where homeless individuals would congregate.

## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

### **L007-35**

Refer to Standard Response FB-Response-LU-03, FB-Response-LU-04.

### **L007-36**

Refer to Standard Response FB-Response-GENERAL-12.

### **L007-37**

Refer to Standard Response FB-Response-GENERAL-12.

Alignment plans and maps of parcels directly affected by the project, where the whole parcel or a portion thereof would be acquired by the project, are provided in Volume III of the Revised DEIR/Supplemental DEIS. The project alternatives near Hanford would be either east or west of the main downtown area and therefore would not have a significant economic impact.

### **L007-38**

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-GENERAL-18.

See Section 3.12 Impact SO #5- Temporary Construction Employment, for information on the number of construction jobs created as a result of the project as well as the ability of the existing regional labor force to fill the demand for the direct construction jobs as well as the resulting indirect and induced jobs. Section 3.18 presents the amount of construction- and operation-related employment created by the project. Over the entire construction period about 22,000 1-year full-time job equivalents would be created as a result of the Project. During peak construction, this amounts to about 3,300 jobs per year. Over the entire construction period, project expenditures would result in an additional 2.4% of the total projected 2016 construction jobs in the region (see Table 3.18-3). This small percentage increase would not be substantial enough to greatly attract workers to the region or cause increased demand for housing and community services because the existing underemployed construction work force would be expected to fill these jobs. Similarly, the analysis of long term job creation shows the Project would require about 2,000 jobs to operate and maintain the HST, and about 45,000 jobs would be created throughout the state by 2035 as a result of increased mobility and growth. This is only a 3.2% increase in employment over the jobs expected

### **L007-38**

to be created under the No Project Alternative and would therefore not place additional demand on housing and community services in the region. As described in FB-Response-GENERAL-18, the Authority has committed to measures to train and hire local and disadvantaged workers to fill these jobs.

The San Joaquin Valley has greater unemployment and a lower per capita income than the state as a whole. The Authority has adopted a Community Benefits Policy, which requires that design-build construction contracts will be required to adhere to the National Targeted Hiring Initiative, which states a minimum of 30% of all project work hours shall be performed by National Targeted Workers and a minimum of 10% of National Targeted Workers hours shall be performed by Disadvantaged Workers. This, along with other hiring policies, will make sure that employment and business opportunities created by the project are accessible to the local community. For more information on hiring policies, see the Authority's website.

### **L007-39**

A level of service (LOS) of F was predicted for SR 198 in the future, without or with the project (Table 3.2-23). The volume-to-capacity ratios would also be the same, without or with the project. This indicates that although the highway may be at capacity in the future, the alternative alignments would not noticeably change the condition. The HST project intends to only mitigate the decrease in LOS directly resulting from HST activities.

As stated in Section 3.2.5.3, Tables 3.2-26 and 3.2-27 present Existing Plus Project and Future Plus Project conditions (2035) for the Hanford-Armona Road/13th Avenue/SR 198 WB on-ramp would be affected. These effects are considered to have moderate intensity under NEPA. Impacts would be significant under CEQA. Tables 3.2-48 and 3.2-49 show mitigation for these impacts. However, timing of the construction of the Kings/Tulare Regional Station would depend on ridership, and it is possible that improvements planned for the SR 198/13th Avenue /Hanford-Armona Road interchange would be constructed prior to construction of the HST station. In addition, the Authority is committed to working with jurisdictions to implement mitigation measures in a coordinated manner in order to maximize planned improvements.

## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

### **L007-40**

Refer to Standard Response FB-Response-LU-04.

As described in FB-Response-LU-04: Effects on Future Land Use, the CEQA evaluation for the effects on future land use and the change in land use is based upon the existing conditions, and approved or funded future projects. Where the HST would add incrementally to an existing transportation corridor (such as adjacent to the BNSF railroad), the HST would not preclude future development. In addition, the HST's traffic impacts are the difference between the no project conditions in the future, and the conditions with each HST alternative, and therefore the HST may contribute to an intersection or roadway impact, but the change is in addition to existing and future traffic. Funding that has been, or will be, collected for purposes of mitigating other projects would still apply to transportation improvements at specific locations, as would any proportional responsibility determined for the HST.

### **L007-41**

The Revised DEIR/Supplemental DEIS discusses impacts on the future project in Section 3.19, Cumulative Impacts. The Live Oak project is included in Appendix 3.19-A, Table 3.19-A-3, and was included in the cumulative analysis of the project's impacts in Section 3.19.4. The Hanford West Bypass 1 and Bypass 2 alternatives would interact with the approved Live Oak Master Plan. These alternatives would bisect the western portion of the Live Oak Master Plan, through areas designated for residential use. The resulting close adjacency between the proposed HST alignments and the high-sensitivity residential viewers in the master plan area would result in a strong decline in visual quality as seen by these high-sensitivity/high exposure viewers, and represent an effect of substantial intensity under NEPA. Because the residential development plans in combination with the Hanford West Bypass 1 and Bypass 2 alternatives would change the agricultural character of the existing landscape, this would be a significant impact under NEPA. The HST project's contribution to this impact would be cumulatively considerable under CEQA.

### **L007-42**

Section 3.13.5.3 includes an analysis of the land use impacts of all the HST stations in the Fresno to Bakersfield segment, including the Kings/Tulare Regional Station—East Alternative and the Kings/Tulare Regional Station—West Alternative. The Authority chose to study a station in the Hanford area in keeping with the commitment made in the Statewide Program EIR/EIS to investigate alternatives that serve a potential station in the Visalia-Tulare-Hanford area as outlined in the Visalia-Tulare-Hanford Station Feasibility Study (Authority 2007).

As discussed in the Revised DEIR/Supplemental DEIS, the Kings/Tulare Regional Station—East Alternative would convert about 22 acres of agricultural land in unincorporated Kings County into a transportation use. The Authority would work with the City of Hanford and Kings County to discourage growth in the vicinity of the station by restricting onsite parking and encouraging transit to the station from downtown Hanford, Visalia, and Tulare, and by purchasing agricultural conservation easements from willing sellers of adjacent agricultural lands. However, it is likely that the location of the station at this site would attract at least transportation-oriented commercial development. While current zoning allows for industrial uses of some of the land adjoining the Kings/Tulare Regional Station—East Alternative, most of the area continues to be zoned for agriculture and is in agricultural use. In addition, current plans and policies of the City of Hanford call for development to the west of the city and not to the east. This is partially due to the lack of sewer conveyance facilities on the eastern edge of Hanford and the expense of extending this infrastructure out to the proposed station site. The Revised DEIR/Supplemental DEIS notes that the Kings/Tulare Regional Station—East would change the pattern and intensity of the use of the land, would be incompatible with adjacent land uses, and is likely to result in some unplanned changes in the use of existing adjacent land.

As discussed in Section 3.18.5.3, developing the Kings/Tulare Regional Station—East Alternative could remove a barrier to growth through the extension of infrastructure to the station. This would allow for more development to occur around the station and along the path of the infrastructure expansion. Developing around the stations may be desirable to businesses and residences by creating a direct transportation link to areas with more business and employment opportunities. That is, people could travel from Hanford to meetings or jobs in Bakersfield or Fresno more easily and quickly. Even

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## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

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### L007-42

given the Urban Reserve and agricultural land use designations surrounding the Kings/Tulare Regional Station–East Alternative area, the potential for the Authority to purchase agricultural conservation easements around the station (easements must be purchased from willing sellers), and the Authority’s vision for the Kings/Tulare Regional Station–East Alternative to act as a transit hub, the potential for indirect effects on land use in the area surrounding the Kings/Tulare Regional Station–East Alternative is high. Due to this high potential, the Authority could work with local government, the California Department of Conservation, and non-governmental agencies to purchase agricultural conservation easements around the station to keep the land in agricultural production to discourage direct or indirect growth around this station. However, the Revised DEIR/Supplemental DEIS does acknowledge the potential for undesired growth to occur.

Section 3.13.5.3 discusses the fact that the Kings/Tulare Regional Station–West Alternative would convert about 44 acres of agricultural, residential, and industrial land uses to a transportation use. Like the Kings/Tulare Regional Station–East Alternative, the Authority would work with the City of Hanford and Kings County to discourage growth in the vicinity of the Kings/Tulare Regional Station–West. However, it is likely that at least transportation-oriented commercial development would take place in the vicinity of the station, which would be incompatible with current land uses. Although the City of Hanford is directing growth on its western edge, future commercial development is envisioned closer to SR 198 than the Kings/Tulare Regional Station–West. Plans and policies for land use in the vicinity of the station site continue to be largely focused on agricultural uses. The Kings/Tulare Regional Station–West would change the pattern and intensity of the use of the land and would be incompatible with adjacent land uses. The presence of the station is likely to result in some unplanned changes in the use of existing adjacent land.

As discussed in Section 3.18.5.3, the Kings/Tulare Regional Station–West Alternative consists of unincorporated land adjacent to the City of Hanford’s western Planning Area Boundary and within the Armona Community Planning Area of Kings County. The station site would be located in an area categorized in the Kings County General Plan as Urban Fringe, in an area designated as a Primary sphere of influence. The “Urban Fringe” Land Use Category is intended to represent residential, commercial, and

### L007-42

industrial land uses immediately adjacent to Hanford. The station site land use designation within Kings County is Limited Agriculture, as is all adjacent land to the west, north, and east. Developing a station could remove a barrier to growth through the extension of infrastructure to the stations. This would allow for more development to occur around the stations and along the path of the infrastructure expansion. Developing around the stations may be desirable to business and residences by creating a direct transportation link to areas with more business and employment opportunities. Therefore, the Revised DEIR/Supplemental DEIS acknowledges that the potential for indirect effects on land use in the area surrounding the Kings/Tulare Regional Station–West Alternative is high.

### L007-43

Refer to Standard Response FB-Response-GENERAL-13.

Environmental analysis of subsequent sections of the HST System that are planned to connect Bakersfield to Los Angeles is currently under way. The Central Valley sections of the HST System are an integral portion of the statewide system connecting San Francisco and the Bay Area to Los Angeles and Anaheim.

### L007-44

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-04, FB-Response-AG-01, FB-Response-AG-07, FB-Response-GENERAL-03.

The Authority is meeting all requirements for the acquisition of contracted land for public purposes required by the Williamson Act. This includes filing the necessary notice and findings with the Director of the Department of Conservation under Government Code Section 51291.

The Authority has attempted to minimize impacts to all agricultural lands, including lands in Williamson Act contracts and agricultural preserves. A Project Design Feature includes the formation of a Farmland Consolidation Program that will assist in the sale of remnant parcels to farmers, and Mitigation Measure Ag-MM #1 in Section 3.14.7, which will fund the acquisition of agricultural conservation easements from willing sellers by the existing California Farmland Conservancy Program.

## Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

### **L007-44**

In April 2013, the Authority reached an agreement with agricultural interests on mitigation of agricultural land impacts for the Merced to Fresno Section of the HST System (Authority 2013). Under that agreement, the Authority will acquire agricultural conservation easements for its impact on Important Farmland (i.e., land classified as prime farmland, farmland of statewide importance, farmland of local importance, and unique farmland) at the following ratios:

- Important Farmland converted to nonagricultural uses either by direct commitment of the land to project facilities or by the creation of remnant parcels that cannot be economically farmed will be mitigated at a ratio of 1:1.
- Where HST project facilities would create a remnant parcel of 20 acres or less in size, the acreage of that remnant parcel will be mitigated at a ratio of 1:1.
- An area 25 feet wide bordering Important Farmland converted to nonagricultural uses by project facilities (not counting remnant parcels) will be mitigated at a ratio of 0.5:1.

### **L007-45**

Refer to Standard Response FB-Response-AVR-03.

Short-term measures to mitigate visual impacts would need to be developed on a site-by-site basis during detailed project design. The effectiveness and appropriateness of measures would vary by situation as well. The Authority will work with local governments and concerned parties during the final design phase to develop site-specific measures.

Table 3.16-2 in Section 3.16, Aesthetics and Visual Resources, of the Revised DEIR/Supplemental DEIS has been revised to address graffiti and blight. Also, construction mitigation measure AVR-MM#1a has been revised to state "Any graffiti or visual defacement of temporary fencing and walls will be painted over or removed within 5 business days." Project Mitigation Measures AVR-MM#2f and AVR-MM#2h have been revised to state: "Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable time after notification."

### **L007-46**

A LOS of F was modeled for SR 198 in the future, without or with the project (Table 3.2-23). The volume to capacity ratios would also be the same, without or with the project.

### **L007-46**

This indicates that although the highway may be at capacity in the future, the alternative alignments would not noticeably change the condition. The traffic analysis was performed with and without a traffic signal installed at the intersection of 13th Avenue/SR 198. The intersection is predicted to operate at LOS F with or without the project (and no signal). With signals at both the westbound ramp and eastbound ramp, the intersections are predicted to improve to LOS A (Table 5.5-1, Fresno to Bakersfield Transportation Technical Analysis). Analysis for 13th Avenue was modeled conservatively as one lane in each direction for existing and future scenarios as well as mitigated conditions. Although the City's General Plan describe this roadway as an ultimate four-lane arterial, there are no plans or funded projects that warrant this assumption incorporated into the analysis.

### **L007-47**

Refer to Standard Response FB-Response-GENERAL-08.

The California High-Speed Rail Authority will continue to coordinate with the City of Hanford during the procurement stage to agree upon the required level of roadway improvements for Hume Ave. associated with the HST project (Hume Ave. does not currently cross the proposed alignment).

Hume Avenue does not extend west of 12th Avenue. The Hanford West Bypass alignment is near 13th Avenue.

Extending the below-grade profile near residential development can provide noise and visual mitigation, but at a very high cost.

### **L007-48**

Refer to Standard Response FB-Response-N&V-05.

Extending the below-grade profile near residential development can provide noise and visual mitigation, but at a very high cost.

### **L007-49**

The information presented in Section 3.12 about Ponderosa is not in error, however, the

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Response to Submission L007 (Melody Haigh, City of Hanford, October 18, 2012) - Continued

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**L007-49**

text has been amended to clarify that this community is on the outskirts of Hanford and does not have many services or facilities, but residents place a high value on living a rural lifestyle near city services such as hospitals, government services offices, and access to regional transportation networks.

As detailed in Section 3.12 Impact SO#6, in the Ponderosa Road community, potentially up to half of the existing ranch-style homes could be displaced by the BNSF Alternative. In this location, residents enjoy a unique blend of amenities and very few comparable, vacant, developed rural residential homes may be available as replacement properties. If so, it may be necessary to consider constructing housing of last resort, including rehabilitation of existing housing or relocation of disrupted residential area to newly constructed housing elsewhere in the vicinity. Even if replacement housing were to be constructed to meet these needs, these replacements would not represent a substantial number of new homes, and therefore the impact would be less than significant under CEQA.

The Kings/Tulare Regional Station–East Alternative would be built on the elevated guideway close to this community, just north of the existing freight-rail tracks. Given these impacts, the project would affect community character, social interactions, and community cohesion by displacing potentially half of the households, and by exposing the remaining rural residential homes to increased noise, visual, and traffic impacts. This would be of substantial intensity under NEPA and a significant impact under CEQA. Mitigation Measure SO-1 was developed to reduce the impacts associated with the division of existing communities, including Ponderosa, by conducting special outreach to affected homeowners and residents to fully understand their special relocation needs. Even with this mitigation, the impact related to the division of existing communities would remain significant.

Submission L008 (John Guinn, City of Shafter, October 18, 2012)



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Fresno to Bakersfield Revised  
DEIR/Supplemental DEIS Comment  
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October 18, 2012

Fresno to Bakersfield Revised  
DEIR/Supplemental DEIS Comment  
770 L Street, Suite 800  
Sacramento, CA 95814

RE: City of Shafter Comments for California HST Project Fresno to Bakersfield Revised  
DEIR/Supplemental DEIS Comment

Dear Sir or Madam:

- L008-1 The proposed California High-Speed Train Project Fresno to Bakersfield WS1 alignment through Shafter requires below-grade crossings for freight at North Shafter Avenue, East Lerdo Highway, and South Beech Avenue/East Los Angeles Street. The below-grade crossings are necessary to mitigate potential significant impacts to transportation and public safety. If funded by the California High Speed Rail Authority, the City of Shafter is willing to take the lead on any additional environmental documentation that would be required to construct the below-grade crossings.
- L008-2 All at-grade portions of the same WS1 alignment that traverse Poplar Avenue, Fresno Avenue, Burbank Street, Driver Road, and Seventh Standard Road require installation of adequate casing for existing and future sewer, water, and other public utility services. The casings are necessary to mitigate potential significant impacts to public utilities and services.
- L008-3 The proposal to purchase noise easements is not an acceptable mitigation measure for the City of Shafter. The measure would do nothing to reduce the project's significant impacts on the environment regarding noise. Not reducing the project's noise impacts would significantly reduce property values and the quality of life in the City of Shafter. The proposal must mitigate project noise impacts to levels less than significant. The proposal should also provide adequate funding for the City of Shafter to notify and inform property owners of new construction on the improvements needed for building sound insulation to reduce the project's noise impacts to levels less than significant.
- L008-4 The Wasco-Shafter Bypass would not only significantly impact 667 acres of productive agricultural land but it would also have corresponding impacts on Shafter's economy. Much of Shafter's economy is dependent on area agricultural production. The project's impact on Shafter's economy is not analyzed in the revised DEIR/ Supplemental DEIS regarding the proposed reduction in productive agricultural land.

L008-5

The California High-Speed Train Project Fresno to Bakersfield Revised DEIR/Supplemental DEIS states the project will increase the population in Fresno, Kings, Tulare, and Kern counties by 110,650 persons (see page 3.18-32). The Revised DEIR/Supplemental DEIS further states that the project will require an additional 11,065 acres (17 square miles) of land to house the probable density of approximately 10 persons per acre (see page 3.18-32). Since none of the subject local jurisdictions have planned for this induced population growth, the project would have a potential significant impact on air quality, greenhouse gas emissions, agriculture, public services, and transportation. Even though the Revised DEIR/Supplemental DEIS assumes residential densities will be increased near the Bakersfield and Fresno High-Speed Train stations and existing Spheres of Influence are large enough to accommodate the induced growth, there is no substantial evidence presented in the Revised DEIR/Supplemental DEIS that shows how the impact(s) will be reduced to a level that is less than significant. The impact on local communities has not been addressed.

On behalf of the City of Shafter, I want to thank the California High-Speed Rail Authority for providing the opportunity to comment on the revised DEIR/Supplemental DEIS.

Sincerely,

John Guinn  
City Manager

City Manager: (661) 746-5000 / Fax (661) 746-0607 • Finance: (661) 746-5001 / Fax (661) 746-1002  
Planning/Building/Engineering: (661) 746-5002 / Fax (661) 746-9125 • www.shafter.com

Submission L008 (John Guinn, City of Shafter, October 18, 2012) - Continued



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Shafter, California  
93263



Fresno to Bakersfield Revised  
DEIR/Supplemental DEIS Comment  
770 L Street, Suite 800  
Sacramento, CA 95814

95814335500

## Response to Submission L008 (John Guinn, City of Shafter, October 18, 2012)

### L008-1

Refer to Standard Response FB-Response-GENERAL-08.

CHSRA will continue coordination with the City of Shafter and other local agencies on the required level of roadway improvements associated with the HST project.

### L008-2

Refer to Standard Response FB-Response-PU&E-03.

### L008-3

Refer to Standard Response FB-Response-N&V-05.

### L008-4

For information on the economic effects on agriculture see EIR/EIS Volume I Section 3.12 Impact SO #15. For a detailed analysis of the effects of the HST project on agricultural production, see Appendix C of the Community Impact Assessment Technical Report (Authority and FRA 2012h). The analysis in that appendix provides these results by county and by project alternative in terms of the number of acres of agricultural production lost, the resulting annual revenue loss in both dollar and percent terms for each type of agricultural project, and the employment loss. This was performed for each project alternative by county because impacts to agricultural lands occur both within city limits and in the unincorporated areas outside of cities. Agricultural production and related employment impacts occur across the city and unincorporated area boundaries, and were therefore presented at the county level.

For the Wasco-Shafter Bypass Alternative, the estimated reductions in annual agricultural production value and employment would be \$11.7 million and 230 employees for Kern County. These reductions are the equivalent of about 0.2% of Kern County's estimated \$4 billion in total agricultural production.

### L008-5

Refer to Standard Response FB-Response-GENERAL-03.

The population of the San Joaquin Valley is projected to increase by 66.8% between

### L008-5

2009 and 2035, almost twice the population increase projected for California over the same period. Within the Fresno to Bakersfield four-county study area, this increase would be approximately 73%. The analysis by Cambridge Systematics, Inc., indicated that with the HST project, there would be a small (approximately 3%) incremental increase in population in the four-county region (approximately 110,650 persons) compared with forecasted growth in the Central Valley without the project (Cambridge Systematics 2007). At current population density rates, an estimated 11,065 acres of land would be needed to accommodate this incremental population increase. However, the HST project is expected to increase development densities, especially in proposed station locations in Fresno and Bakersfield, resulting in more compact development and lower land requirements.

The analysis of HST-induced population and employment growth in Section 3.18, Regional Growth, of the Fresno to Bakersfield EIR/EIS shows that this growth would be consistent with current and anticipated future regional growth management plans and programs, which encourage infill development that would concentrate growth in urban areas. Section 3.18.2 discusses the requirements of Senate Bill (SB) 375, which encourage more compact development patterns in the future. Section 3.13, Station Planning, Land Use, and Development, describes how the Authority's adopted Station Area Development Policies and local plans encourage beneficial high-density, transit-oriented development in the urban areas around the Fresno and Bakersfield stations and discourage the potential for development at urban boundary edges (sprawl). Section 3.13 includes an analysis of the goals and policies of the local land use plans and other plans to identify conflicts that could result in potential environmental impacts.

See Chapter 2, Alternatives, of the EIR/EIS for information on the modeling tool, Vision California, which details the impacts of various climate, land use, and infrastructure policies, and describes the associated development patterns resulting from these policies. Results are produced for a range of metrics, including greenhouse gases, air pollutants, fuel use and cost, building energy use and cost, residential water use and cost, land consumption, and infrastructure cost. The Vision California Plan was written to highlight the unique opportunity presented by California's planned HST System in shaping growth and other investments. More information about Vision California is available at <http://visioncalifornia.org/index.php>.

*City of Visalia*  
425 East Oak Avenue, Ste. 301, Visalia, CA 93291



Tel: (559) 713-4512 Fax: (559) 713-4800

RECEIVED  
10/22/12

Amy Shuklian  
Mayor

Steven A. Nelsen  
Vice Mayor

Gregory F. Collins  
Councilmember

E. Warren Gubler  
Councilmember

Bob Link  
Councilmember

Dear Sir/Madam:

The Revised DEIR/DEIS analyzes several project modifications to the Fresno-Bakersfield segment. A major revision to the DEIR/DEIS is the addition and analysis of a "Hanford West Alternative" rail alignment alternative in Kings County. The City of Visalia believes the Hanford West Alternative station site is environmentally inferior to the Hanford East Alternative station site (located at Highway 43 and State Highway 198) because the Hanford West site will significantly reduce ridership generated from the Kings County/Tulare County region and increase the generation of greenhouse gas emissions and fossil fuel consumption. As a result, if selected, the Hanford West station site could significantly reduce potential environmental benefits of the proposed HST system. Therefore, the City of Visalia strongly recommends that the Hanford West Alternative be rejected, and the Hanford East Alternative and potential future Kings-Tulare Regional Station at the juncture of Highway 198 and Highway 43, as shown in the DEIR/DEIS, be selected as the environmentally superior alternative.

The exact distance between the Hanford East and Hanford West alternative stations sites could not be readily found in the DEIR/DEIS, but scaling the maps in the document generates an estimated separation distance of more than 5 miles. Therefore, potential train passengers located northeast, east, and southeast of Hanford must consider the additional 5+ mile distance in terms of cost, time and convenience while making decisions on whether to ride the HST or choose another form of transportation (primarily automobiles). A substantial, though undetermined, number of potential passengers will not use the HST due to additional time and cost, and reduced convenience, associated with the Hanford West station site. The potentially significant reduction in ridership due to additional travel time and distance for Tulare County residents to access the Hanford West station site, in comparison to the more accessible Hanford East station site, needs to be analyzed in the DEIR/DEIS.

L009-3

L009-4

L009-5

- Population concentrations in the Kings County/Tulare County region are primarily located in Tulare County. DEIR/DEIS Table 2-4 (Regional Projected Population and Employment) identifies the estimated Year 2010 populations for Kings County as 156,289 and Tulare County as 447,814. Table 2-4 also projects Year 2035 populations for these counties as 274,576 and 809,789 respectively. The significant population disparity between the two counties leads to the conclusion that ridership potential for the future Kings-Tulare Regional Station will be highly dependent upon Tulare County residents. However, the much larger population in Tulare County would be forced to consider travelling over 5 miles additional distance to access the Hanford West station site as compared to the Hanford East site. Tulare County residents will consider the time, cost and convenience of travelling the additional 5+ miles, and many residents may choose to not use high speed rail due to the longer distance to a Hanford West station. Therefore, the longer distance to the Hanford West station site will be a disincentive to Tulare County residents and substantially reduce HST ridership at a West Hanford station site. This potential effect needs to be analyzed in the DEIR/DEIS.
- Many households in Kings County and Tulare County are low income and many local communities have high concentrations of poverty. According the California Department of Finance – 2011 American Community Survey, 21.1% of all families in Tulare County had 2011 incomes below Federal poverty levels. Further, according to the State Employment Development Department, Tulare County posted an unemployment rate of 15% in September 2012, well above both National, and State averages. Clearly, average income levels are very low in Tulare County and historical unemployment rates are very high compared to the majority of California. Low income individuals and households are more dependent upon transit in all forms. Reduced convenience and higher cost to travel to a West Hanford station will discourage low income residents from using high speed rail and create barriers for these persons to access jobs, educational and medical facilities, and other services in major urban centers of California. The impact to low income residents and households in Tulare County if a more distant Hanford West station site is selected in comparison to a more convenient Hanford East site must be analyzed in the DEIR/DEIS.
- Automobile travel is a major source of excessive regional air pollution as described in the DEIR/DEIS. Emphasized attributes of High Speed Train travel are benefits to air quality due to reduced automobile traffic and reduced highway congestion. To achieve these benefits, HST station sites must be readily and conveniently accessible to the greatest number of people. Failure to meet this objective will result in reduced air quality benefits in our heavily impacted air basin. In the Kings County/Tulare County region, this objective can only be accomplished by locating a station site most convenient to population concentrations located in Tulare County. Between the two alternatives presented in the Draft DEIR/DEIS the station site most accessible to the largest population centers in the Kings-Tulare region is the Hanford East station site. This potential impact to air quality must be analyzed in the EIR with an evaluation of the East Hanford and West Hanford alternative station sites.

Submission L009 (Amy Shuklian, City of Visalia, October 18, 2012) - Continued

L009-6

- Reduced air quality benefits caused by lowered area ridership will also reduce climate change benefits of the HST project. Alleviating climate change is another important objective of the HST project. Route and station location decisions will determine the effectiveness of the project in meeting environmental objectives regarding climate change. Selecting the Hanford East station site will maximize convenience to the greatest number of residents in the two county area, thereby achieving maximum benefits in addressing climate change and other environmental effects. The DEIR/DEIS must evaluate climate change implications caused by alternative station site accessibility.

Thank you for considering the comments of the City of Visalia on the Revised DEIR/DEIS for the Fresno to Bakersfield segment. If you have any questions, please contact Mike Olmos, Assistant City Manager at 559-713-4332 or [molmos@ci.visalia.ca.us](mailto:molmos@ci.visalia.ca.us).

Sincerely,

*Amy Shuklian*

Amy Shuklian, Mayor



NEW 60509874  
\$00.424  
10/18/2012  
United States 93756  
US POSTAGE



FIRST CLASS

RETURN SERVICE REQUESTED

Fresno to Bakersfield Revised  
DEIR/Supplemental DEIS Comment  
California High Speed Rail Authority  
770 L Street, Suite 1000  
Sacramento, CA 95814



31 450296P

## Response to Submission L009 (Amy Shuklian, City of Visalia, October 18, 2012)

### L009-1

Refer to Standard Response FB-Response-GENERAL-10.

As stated in Section 2.1.2, Fresno to Bakersfield Section EIR/EIS Background, of the EIR/EIS, the Authority and FRA decided to reintroduce an alignment alternative west of Hanford to address substantive comments received during public and agency review, including requests from the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) to include a Hanford West Bypass Alternative in the environmental analysis of the Draft EIR/EIS in an attempt to reduce or avoid significant environmental effects. The Authority conducted a supplemental alternatives analysis to further evaluate potential alignment alternatives west of Hanford, and on the basis of this analysis, identified two Hanford West Bypass alternatives to carry through the environmental analysis in the Draft EIR/EIS. Both of these alternatives include a station site.

The Authority studied station locations in the Hanford area in keeping with the commitment it made in the Statewide Program EIR/EIS (Authority and FRA 2005) to investigate alternatives that serve a potential station in the Visalia-Tulare-Hanford area and as outlined in the Visalia-Tulare-Hanford Station Feasibility Study (Authority 2007).

Section 8.1.1.1 of the referenced Feasibility Study describes project performance measures, including population and employment catchment information. Population and employment data were compiled to determine the number of existing and projected residents and jobs that would be captured within a 20-mile radius of the station location alternatives. Although the Kings/Tulare Regional Station–West Alternative was not identified at the time that this report was prepared, its location falls within all of the studied station location catchment areas, and in general the population data for the catchment areas was similar.

The Kings/Tulare Regional Station is no longer considered a "potential" station. The Authority and FRA will construct a Kings/Tulare Regional Station in the vicinity of Hanford as part of the project. Construction timing would be based on ridership demand in the region, and would occur during Phase 2 of the statewide project, sometime after 2020.

### L009-1

The Authority has used the information in the Revised DEIR/Supplemental DEIS and input from the agencies and public to identify the Preferred Alternative in the Final EIR/EIS. The decision has included consideration of the project purpose, need, and objectives presented in Chapter 1, Project Purpose, Need, and Objectives, of the Final EIR/EIS, the objectives and criteria in the alternatives analysis, and the comparative potential for environmental impacts. The Preferred Alternative has the least overall impact on the environment and local communities, the lowest cost, and the fewest constructability constraints of the project alternatives evaluated.

### L009-2

The Hanford West station site (i.e., the Kings/Tulare Regional Station–West Alternative) is approximately 5.5 miles west of the Hanford East station site (i.e., the Kings/Tulare Regional Station–East Alternative). It is possible that locating the station on the west side of Hanford could reduce the ridership generated from the Kings County/Tulare County region. However, it is not possible to determine if that is correct and if there is a reduction, how great that reduction would be. Both sites are immediately adjacent to State Route (SR) 198. From Downtown Visalia, it would take approximately 21 minutes to reach the Hanford East station site and 25 minutes to reach the Hanford West station site. From Downtown Tulare, it would take about 24 minutes to reach the Hanford East station site and 28 minutes to reach the Hanford West station site. This difference in travel time may not discourage many travelers, regardless of the difference in distance.

As indicated in Section 3.2, Transportation, of the Final EIR/EIS, the daily vehicle trips associated with the Kings/Tulare Regional Station are estimated to be 1,730. By traveling 5.5 miles more to reach the Hanford West station, this station alternative would result in an additional 9,515 VMT per day, which would equate to approximately 3.2 metric tons of carbon dioxide per day. In comparison, the California Air Resources Board reported that the net carbon dioxide equivalent emissions in California were 457,000,000 metric tons in 2009 ([http://www.arb.ca.gov/cc/inventory/pubs/reports/ghg\\_inventory\\_00-09\\_report.pdf](http://www.arb.ca.gov/cc/inventory/pubs/reports/ghg_inventory_00-09_report.pdf) [CARB 2011]).

## Response to Submission L009 (Amy Shuklian, City of Visalia, October 18, 2012) - Continued

### L009-3

The Hanford West station site (i.e., the Kings/Tulare Regional Station–West Alternative) is approximately 5.5 miles west of the Hanford East station site (i.e., the Kings/Tulare Regional Station–East Alternative). It is possible that locating the station on the west side of Hanford could reduce the ridership generated from the Kings County/Tulare County region. However, it is not possible to determine if that is correct and if there is a reduction, how great that reduction would be. Both sites are immediately adjacent to State Route (SR) 198. From Downtown Visalia, it would take approximately 21 minutes to reach the Hanford East station site and 25 minutes to reach the Hanford West station site. From Downtown Tulare, it would take about 24 minutes to reach the Hanford East station site and 28 minutes to reach the Hanford West station site. This difference in travel time may not discourage many travelers, regardless of the difference in distance.

### L009-4

The environmental justice analysis adheres to the criteria outlined in Executive Order 12898 and U.S. Department of Transportation Order 5610.2, which defines an environmental justice effect as a "disproportionately high and adverse effect on minority and low-income populations." This adverse effect is one that is predominately borne by a minority population and/or a low-income population or that would be appreciably more severe or greater in magnitude for the minority and/or a low-income population than the adverse effect that would be suffered by the nonminority and/or non-low-income population along the project alignment. Section 4.3 in the Community Impact Assessment Technical Report (Authority and FRA 2012h) identifies the environmental justice populations along the project alignment. The effect associated with the location of the Kings/Tulare Regional Station would bring neither disproportionately high and adverse effects nor benefits to minority and low-income populations.

### L009-5

Refer to Standard Response FB-Response-GENERAL-10.

The Final EIR/EIS contains two types of emissions analyses related to vehicle travel. The first analysis is a regional estimate of the change in vehicle miles traveled (VMT) due to the HST project. This first analysis indicates that, compared with the No Project Alternative, there is a net decrease in VMT and associated criteria pollutant and greenhouse gas emissions under two different HST ridership scenarios.

### L009-5

The second analysis provides a local emissions estimate for each of the three stations (Fresno, Kings/Tulare Regional, and Bakersfield). For this local analysis, employee, bus, and passenger trips are estimated for each station. The estimated number of passengers for each of these regional stations is assigned a round-trip length of 40 miles in all cases, regardless of location, because a more-refined trip length estimate is not available. Although some small variation in the actual vehicle miles traveled associated with a specific station alternative is expected, this variation is estimated to be small compared with the larger net decrease in total regional VMT (and air emissions) associated with the HST project, when compared with the No Project Alternative.

Specifically, for the Kings/Tulare Regional Station, the distance separating the different station alternatives is approximately 5.5 miles. If it is assumed that all bus and passenger trips would travel this additional trip length, the change in local VMT and emissions would increase by only 11% compared with the local station VMT and associated emissions analysis. Total regional emissions from the additional trip length for the Kings/Tulare Regional Station alternatives represent only a 0.1% change.

Table 1405-1, below, shows the details of the Kings/Tulare Regional Station emissions from the additional VMT.

#### **Table 1405-1: Kings/ Tulare Regional (KTR) Station: Operational Emissions**

#### **Operational VMT Emissions associated with extra distance between Alternatives of KTR Station**

## Response to Submission L009 (Amy Shuklian, City of Visalia, October 18, 2012) - Continued

### L009-5

Emission Source	Number of Round Trips per Day (1, 2, 3)	Round Trip Distance (miles)	Emissions (tpy)							
			ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
<b>Operational Year 2035</b>										
Passengers by Shuttle / Bus (4)	10	5	0.000	0.005	0.009	0.000	0.001	0.000	10	0.000
Passengers by Car (5)	1,700	5	0.027	2.146	0.190	0.011	0.119	0.070	1,100	0.021
<b>Additional 2035 Total</b>	—	—	<b>0.028</b>	<b>2.151</b>	<b>0.199</b>	<b>0.011</b>	<b>0.120</b>	<b>0.071</b>	<b>1,110</b>	<b>0.022</b>
<b>EIR Reported 2035 Total for Station VMT</b>	—	—	<b>0.222</b>	<b>17.348</b>	<b>1.605</b>	<b>0.090</b>	<b>0.964</b>	<b>0.569</b>	<b>9,952</b>	<b>0.174</b>
<b>Percentage Change Compared to Station VMT Total</b>	—	—	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>	<b>11%</b>
<b>Operational Total (Indirect and Direct)</b>	—	—	<b>-124</b>	<b>-2,457</b>	<b>-699</b>	<b>-10.8854</b>	<b>-88</b>	<b>-62</b>	<b>-1,190,265</b>	—
<b>Percentage Change compared to Operational Total</b>	—	—	<b>0.0%</b>	<b>0.1%</b>	<b>0.0%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	—

Notes:

CH<sub>4</sub> = methane

CO = carbon monoxide

CO<sub>2</sub> = carbon dioxide

NOx = nitrogen oxides

PM<sub>2.5</sub> = particulate matter smaller than or equal to 2.5 microns in diameter

PM<sub>10</sub> = particulate matter smaller than or equal to 10 microns in diameter

ROG = reactive organic gases

SOx = sulfur oxides

tpy = tons per year

1. 200 passengers would arrive at the station via biking or walking; these passengers would not generate air emissions (Porter and Brand 2010).

2. Number of employees at the KTR Station is to the number of employees at the Merced Station (40) as daily boardings at KTR Station (3,300) are to the daily boardings at Merced Station (7,600).

3. Assumed percentage of employees that carpool is: 20%.

### L009-5

4. 300 passengers are assumed to travel by bus (Porter and Brand 2010). Each bus is expected to hold 30 people (Authority and FRA 2012e).

5. 1,700 passengers are assumed to arrive by vehicle (kiss-and-ride drop-offs, vehicles that are parked, rental cars, and taxis) (Porter and Brand 2010).

### Vehicle Emission Factors

Vehicle Type	Vehicle Emission Factor (g/mile) (1)							
	ROG	CO	NOx	SOx	PM <sub>10 (2)</sub>	PM <sub>2.5 (2)</sub>	CO <sub>2</sub>	CH <sub>4</sub>
<b>Operational Year 2035</b>								
Passenger	0.008	0.628	0.056	0.003	0.035	0.021	321.724	0.006
Shuttle / Bus (3)	0.009	0.265	0.463	0.005	0.038	0.020	497.421	0.008

Notes:

1. Emission factors are from EMFAC2007 (Version 2.3) for passenger vehicles (50% LDA-All and 50% of the average of LDT1-All and LDT2-All) and urban buses (UBUS-CAT) traveling at 35 miles per hour (CARB 2006a). All buses and shuttles coming to the KTR Station in 2035 will be natural-gas powered. Temperature of 62 degrees Fahrenheit (annual average for Hanford Station, Western Regional Climate Center) and relative humidity (RH) of 41% are used.

2. Emission factors for PM<sub>10</sub> and PM<sub>2.5</sub> include contributions from exhaust, brake wear, and tire wear.

3. The bus emission factors were determined using only 2023 to 2035 model years based on a 12-year usable life span for city buses (FTA 2007).

### L009-6

Refer to Standard Response FB-Response-GENERAL-10.

The Final EIR/EIS contains two types of emissions analyses related to vehicle travel. The first analysis is a regional estimate of the change in vehicle miles traveled (VMT)

## Response to Submission L009 (Amy Shuklian, City of Visalia, October 18, 2012) - Continued

### L009-6

due to the HST project. This first analysis indicates that, compared with the No Project Alternative, there is a net decrease in VMT and associated criteria pollutant and greenhouse gas emissions under two different HST ridership scenarios.

The second analysis provides a local emissions estimate for each of the three stations (Fresno, Kings/Tulare Regional, and Bakersfield). For this local analysis, employee, bus, and passenger trips are estimated for each station. The estimated number of passengers for each of these regional stations is assigned a round-trip length of 40 miles in all cases, regardless of location, because a more-refined trip length estimate is not available. Although some small variation in the actual vehicle miles traveled associated with a specific station alternative is expected, this variation is estimated to be small compared with the larger net decrease in total regional VMT (and air emissions) associated with the HST project, when compared with the No Project Alternative.

Specifically, for the Kings/Tulare Regional Station, the distance separating the different station alternatives is approximately 5.5 miles. If it is assumed that all bus and passenger trips would travel this additional trip length, the change in local VMT and emissions would increase by only 11% compared with the local station VMT and associated emissions analysis. Total regional emissions from the additional trip length for the Kings/Tulare Regional Station alternatives represent only a 0.1% change.

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### L009-6

Emission Source	Number of Round Trips per Day (1,2,3)	Round Trip Distance (miles)	Emissions (tpy)							
			ROG	CO	NOx	SOx	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	CH <sub>4</sub>
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Percentage Change Compared to Station VMT Total	—	—	11%	11%	11%	11%	11%	11%	11%	11%
Operational Total (Indirect and Direct)	—	—	-124	-2,457	-699	-10.8854	-88	-62	-1,190,265	—
Percentage Change compared to Operational Total	—	—	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%	—

Notes:

CH<sub>4</sub> = methane

CO = carbon monoxide

CO<sub>2</sub> = carbon dioxide

NOx = nitrogen oxides

PM<sub>2.5</sub> = particulate matter smaller than or equal to 2.5 microns in diameter

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3. Assumed percentage of employees that carpool is: 20%.

## Response to Submission L009 (Amy Shuklian, City of Visalia, October 18, 2012) - Continued

### **L009-6**

4. 300 passengers are assumed to travel by bus (Porter and Brand 2010). Each bus is expected to hold 30 people (Authority and FRA 2012e).

5. 1,700 passengers are assumed to arrive by vehicle (kiss-and-ride drop-offs, vehicles that are parked, rental cars, and taxis) (Porter and Brand 2010).

### **Vehicle Emission Factors**

Vehicle Type	Vehicle Emission Factor (g/mile) (1)							
	ROG	CO	NO <sub>x</sub>	SO <sub>x</sub>	PM <sub>10 (2)</sub>	PM <sub>2.5</sub> <sup>2</sup>	CO <sub>2</sub>	CH <sub>4</sub>
<i>Operational Year 2035</i>								
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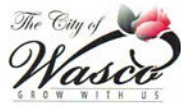
### **Notes:**

1. Emission factors are from EMFAC2007 (Version 2.3) for passenger vehicles (50% LDA-All and 50% of the average of LDT1-All and LDT2-All) and urban buses (UBUS-CAT) traveling at 35 miles per hour (CARB 2006a). All buses and shuttles coming to the KTR Station in 2035 will be natural-gas powered. Temperature of 62 degrees Fahrenheit (annual average for Hanford Station, Western Regional Climate Center) and relative humidity (RH) of 41% are used.

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3. The bus emission factors were determined using only 2023 to 2035 model years based on a 12-year usable life span for city buses (FTA 2007).

Submission L010 (Dan Allen, City of Wasco, September 10, 2012)



City of Wasco (661) 758-7214 Fax (661) 758-1728  
764 E. Street, Wasco, CA. 93280

September 10, 2012

**BY MAIL/EMAIL**

California High Speed Rail Authority  
Att. Mr. Jeff Morales  
770 L. Street, Suite 800  
Sacramento, CA. 95814

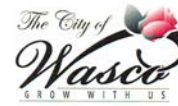
Dear Mr. Morales,

**RE: Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment.**

**Miscellaneous Items**

- |        |  |
|--------|--|
| L010-1 | 1. The EIR/EIS should evaluate all potential safety impacts from construction and operation of the HST. Wasco is urbanized along the railroad tracks, and accidents or explosions from trains traveling at 125 mph could have severe impacts on nearby residences, businesses, roadways, parks and other facilities.   |
| L010-2 | 2. Identify how land and structures within the HST ROW will be cared for and maintained.   |
| L010-3 | 3. Identify responsibility and timeliness of graffiti removal from all HST structures, will the authority seek to enter into maintenance agreements with the City.   |
| L010-4 | 4. Evaluate the impact of relocating City-owned utilities above ground and underground and relocation of the City-owned transit station along the BNSF line to continue operating as an Amtrak stop.   |
| L010-4 | 5. It appears that the proposed HST structures will interfere with several existing City of Wasco public infrastructure improvements including water, sewer, storm drain and an existing well facility. Please include a clear statement in the EIR/EIS indicating that any existing City of Wasco infrastructure improvements disrupted by the construction of the HST will be replaced and/or reconstructed in a manner and to a capacity acceptable to the City of Wasco. |
| L010-5 | 6. Please include a statement in the EIR/EIS indicating that all impacts to public infrastructure systems created by construction of the HST (ie. storm water run-off etc.) will be accommodated in a manner acceptable to the City of Wasco.  |
| L010-5 | 7. Analyze construction and engineering techniques that would reduce construction noise and excavation impacts on adjacent properties, and to preserve existing vegetation and/or provide extensive new mitigation screening.  |

Page | 1



**Traffic Impacts**

- |        |   |
|--------|---|
| L010-6 | 1. Analyze traffic impacts to City streets affected during construction, and specifically identify any streets that would be detoured or closed during construction or permanently as part of the project.  |
| L010-7 | 2. The EIR/EIS should analyze how the project when built and during construction would impact access to the Wasco Transit/ Amtrak Station and impact on other local bus and shuttle services within the City of Wasco.  |
| L010-8 | 3. There is no pedestrian crossing identified along the HST route through the City of Wasco. The City understands that the HST route though the City is to be elevated, the City is concerned that pedestrians crossing the BNSF lines will be distracted by the HST running along the track and that these citizens will not pay the proper attention to on-coming freight trains causing a hazard situation. The City would like to see a pedestrian crossing designed at 6 <sup>th</sup> street and a 6' block wall constructed to the east of the BNSF lines running from 6 <sup>th</sup> street to Poso. |

**Economic Impacts**

- |         |  |
|---------|--|
| L010-9  | 1. Evaluate the potential positive and negative impacts on real property values of adjacent and nearby properties due to the project. The analysis should consider the economic impacts of noise, vibration, increased daily train operations, visual impacts of elevated structures, and changes to circulation and access associated with the project within and surrounding the City of Wasco. The analysis should use property values based on individual communities, not a regional or County-wide average |
| L010-10 | 2. Evaluate the full economic costs of pursuing potential eminent domain.  |
| L010-11 | 3. Evaluate the potential funding generated by air rights development above a depressed track alignment in Wasco (versus an elevated section) and how the development rights might be a funding mechanism for the underground alternative. Identify the agencies that would benefit with revenues from air rights development.   |
| L010-12 | 4. Evaluate economic impacts to City of Wasco's business district that are in close proximity to the rail line and construction. Impacts to be assessed should include both construction period impacts due to reduced access or traffic detours and longer term impacts of noise and visual alterations near these businesses.  |
| L010-13 | 5. Please quantify specific economic and job losses vs. gains to the City of Wasco as a result of this project. There are several statements in the EIR indicating that the economic benefits and job gains in the region outweigh the economic loss and job loss to the region  |

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Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued



L010-13 | (see pg. 3.12-7). Please quantify this for the City of Wasco. The EIR estimates a displacement of 13 businesses and 2 residences in the City of Wasco, including a large almond processing facility currently under expansion in the BNSF alignment R.O.W. Sheet 3 of 32, Section WS1 of the alignment plans shows a utility switching station in the area that this almond processing facility is currently expanding on. Should these businesses or residences be unable to, or chose not to relocate in the City of Wasco, please indicate how the State will backfill the lost revenue to the City.

L010-14 | 6. The minority and low income population in the City of Wasco will bear a disproportionate amount of the project impacts associated with the HST running through Wasco along the BNSF alignment. This population includes the Wasco Housing Authority which houses a large number of low income, minority agricultural workers. According to a statement on page 3.12-122 "offsetting benefits should be considered when evaluating potential disproportionately high and adverse effects on minority or low income populations." Please quantify these benefits for minority and low income populations in the City of Wasco. It is safe to assume that most minority and low income populations will be unable to afford to ride the HST at projected ticket prices of 50 – 80% of air fair. Please address affordability for these populations. If the City is not awarded a HMF creating local jobs, we could potentially lose our Amtrak service (see comment #6 under the Land Use and Community Design section), we could lose upwards of 13 local business and tax revenue as a result, and the majority of residents could not afford to ride the new HST, please indicate what the direct offsetting benefits to the residents of Wasco might be.

L010-15 |

**Visual Impacts**

L010-16 | The City of Wasco General Plan contains many policies directed towards maintaining and enhancing design of private and public facilities to be attractive and compatible with nearby residences, commercial development, and public spaces, including streets. While the Wasco General Plan focus is on building and roadway construction, the EIR/EIS should address similar goals for the proposed High Speed Train. The EIR/EIS should:

1. Analyze how visual impacts would vary with different elevated track alignments and should identify measures to reduce visual impacts to the community. In particular, the visual impacts of the "catenaries" electrified system and associated retaining walls are potentially extensive, adding potentially unattractive clutter and unsightly structures to an alignment that may be 20 or more feet above grade. These lines would occur immediately adjacent to homes, as well as businesses, parks, transit facilities, and other uses and would be visible from all of downtown Wasco and from many points some distance away from the actual tracks. The document should evaluate alternative technologies that would avoid the catenaries, including third rail technology, along with the tunnel (underground) or trench designs.

L010-17 |



L010-18 | 2. Address the impacts of the widened rail right-of-way, grade separations, and construction scenarios on existing trees and other vegetation, and should outline substantial mitigation to minimize the visual impacts of the project, including providing for extensive landscaping to screen the facilities as much as possible.

3. Address the visual impacts of components of the project other than the rail lines, trains, and catenaries, including any proposed safety fencing or walls. Techniques and treatments should be proposed to minimize the intrusiveness and unsightliness of those facilities, and to provide for as much openness and green space as possible.

4. Use state-of-the-art Visualization technology, including photorealistic models and animation, to demonstrate each of the design alternatives of elevated sections through Wasco. This should also include simulations of potential development above and near the alignment with tunnel or cut-and-cover options.

**Land Use & Community Design**

L010-19 | 1. Identify how each of the different vertical track alignments (i.e. tunnel, trench, and track at grade, elevated track) could potentially divide or connect the community. The at-grade and (particularly) elevated options appear to have substantial likelihood of division of the community. The document should, for those options, outline measures to demonstrate how such a project can enhance the community by providing attractive connections and interactions between neighborhoods, commercial/business areas and open spaces/parks.

L010-20 | 2. Evaluate the potential adverse land use and economic issues associated with the establishment of the "ultimate ROW line" and the "loss of use" to those private properties whether the Train is built or not. Once the line is shown on maps, the properties illustrating a significant taking will become effectively useless. The affected property owners will be compensated if the train is built. The unavoidable negative impact will occur on those properties that are not "taken" and are forever in a state of limbo.

L010-21 | 3. Evaluate the potential to sell development rights for a variety of residential, commercial, community, and/or parkland use below the elevated section, and identify the likely impacts of that development.

L010-22 | 4. Wasco is not being considered for a stop/station along the HST route. Evaluate how a potential HST station in Wasco would affect right-of-way needs, and potential impacts of high intensity land use development around such a station. Impacts to be considered should include, but are not limited to economic benefits, traffic and parking, visual resources, noise, open space, and cultural/historic resources.

L010-23 | 5. Propose innovative urban design solutions for underground, at-grade and/or elevated structures that provide for open passage and connections, attractive fences and walls (where such fences and walls are absolutely necessary), extensive landscaping, street furniture, and pedestrian and bicycle amenities, etc.

Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued



L010-24

6. Please clarify what will happen to the City's current Amtrak platform. The EIR is vague and unclear with respect to how the BNSF alignment will affect this valuable community resource. Page 3.2-71 states that the Wasco Amtrak Passenger Platform "may" be affected. It further states that "relocation of the Wasco passenger Platform "may" be completed prior to demolition if necessary to ensure that no disruption to Amtrak service would occur." Please remove the "if necessary" statement and clarify whether or not the Wasco Amtrak Passenger platform will be affected by this project as it appears to be in the HSR ultimate R.O.W. Page 3.12-67 states that "the Amtrak passenger platform may also be displaced." Please clarify. It seems that it should be clear whether or not the platform will be displaced and if it is, it will need to be replaced in a manner that will provide continued Amtrak service to Wasco residents. Again page 3.12-119 states that "The passenger platform in Wasco would also be relocated prior to demolition of the existing structure if necessary." If the existing structure is demolished it will be necessary to relocate and replace it in order to continue the Amtrak service. Please remove the phrase "if necessary."

L010-25

Will the Amtrak train run on the elevated guideway or on the existing tracks? If on the elevated guideway, then an elevated Amtrak passenger platform will need to be constructed to preserve Wasco's Amtrak stop.

L010-26

7. Evaluate the economic impact to Wasco if the AMTRAK station and service is eliminated due to the construction/presence of the HST. Provide connectivity alternatives for Wasco residents who wish to take AMTRAK. Evaluate the additional VMT for Wasco residents who will have to drive to Bakersfield to access AMTRAK service.

L010-27

L010-28

8. Please clarify what will happen to the City owned and operated transit station located immediately adjacent to the Amtrak Passenger Platform. This property is shown to be in the HSR ultimate R.O.W. However, Figure 3.16-44 shows the simulated HST viewpoint from 7<sup>th</sup> street with this building remaining intact. Is this accurate? Please clarify.

L010-29

9. Please clarify land use options under the elevated guideway in the City of Wasco. Will the State permit development in the HST R.O.W. or will this land be required to remain vacant and undeveloped? A statement on page 3.12-119 indicated that "Local communities will provide input on the use of the area underneath the elevated guideway..." Please indicate what the general parameters will be for development under the elevated guideway within the HST R.O.W.

L010-30

10. Evaluate the impact of the high speed rail project alternatives including the impacts of a Wasco to Bakersfield bike trail adjacent to the HST ROW. Also, evaluate the potential to add a bike lane along the HST ROW.

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Dan Allen

City Manager  
City of Wasco

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Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued



## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012)

### L010-1

Although construction through Wasco involves building a large concrete viaduct, construction techniques will not be dissimilar from construction of any concrete bridge. The actual construction area through Wasco is not highly urbanized. Construction accidents can happen, as indicated in Section 3.11.5, Environmental Consequences, of the EIR/EIS, but as discussed in Section 3.11.6, Project Design Features, construction safety and health plans developed by the Authority will establish safety and health guidelines for contractors. These plans will require contractors to develop and implement site-specific measures that address regulatory requirements to protect human health and property at construction sites. Also, final design includes development of a detailed construction transportation plan that would include coordination with local jurisdictions on emergency vehicle access. The plan would establish procedures for temporary road closures, including access to residences and businesses during construction, lane closure, signage and flag persons, temporary detour provisions, alternative bus and delivery routes, emergency vehicle access, and alternative access. The potential risk and consequences of construction accidents were not judged to be great enough to warrant further evaluation.

The HST will operate through Wasco at 220 miles per hour (mph).

As discussed in Section 3.11, Safety and Security, of the EIR/EIS, the HST is an electrified passenger train. Therefore, in the event of an accident, there would not be a fire, explosion, or release of toxic gases associated with fuel or cargo. The hazard associated with the derailment of an HST is the physical mass and speed of the train colliding with a structure or people, which could only occur adjacent to the right-of-way. The FRA (1994) has determined a horizontal separation of approximately 102 feet between the centerlines of adjacent conventional and HST trackways is sufficient to require no additional protection between these lines. Using this distance as the maximum impact zone for an HST accident, people in vehicles on G Street and on sidewalks fronting that street could be impacted by an accident.

The probability of this type of accident is considered to be extremely low. The HST design takes a collision avoidance approach (Rao and Tsai 2007; Wyre 2011) to preventing train-to-train accidents or collisions with objects entering the HST right-of-way. HST systems take advantage of a system-design approach in which the HST, the

### L010-1

automatic train control system, the electrification system, and the rail infrastructure include automation that will control or stop the trains without relying on human involvement. The general approach for the automatic train control system is to monitor the location and speed of all trains on the high-speed network and to coordinate and maintain enough physical separation to allow safe braking. If a fault occurs within the HST network (e.g., intrusion, derailment, significant natural event such as earthquake), the automatic train control system will immediately slow or stop the train and minimize or eliminate a potential hazard. In areas of high risk, the system-design approach can also provide protection from other intrusions into the HST corridor, such as errant automobiles, trucks, or other unauthorized entry, by the use of intrusion-detection and other monitoring equipment to detect a fault and initiate action as needed.

This design approach has been very successful in preventing major accidents on fully dedicated HST systems. Since 1964 and the inauguration of the first HST service in Japan, Japanese HST trains (the Shinkansen) have maintained a record of no passenger fatalities or injuries due to train accidents, including derailments or collisions (Central Japan Railway Company 2011). In France, HSTs (the TGV) have been operating for 27 years and currently carry more than 100 million passengers a year. Like Japan, the French HST system has not had a single HST-related passenger fatality on its dedicated HST trackway, which is similar to the dedicated trackway proposed for the California HST System (TGVweb 2011). Unlike France and Japan, Germany's HST, the InterCity Express (ICE) does not use an entirely dedicated track system, but shares track with freight and conventional passenger rail. An HST accident in the late 1990s prompted design changes to the wheels of German ICE trains to remedy a design flaw (National Aeronautics and Space Administration 2007; North East Wales Institute of Higher Education 2004). German ICE trains carry more than 66 million passengers a year. High-speed train service was introduced in China in 2007 and that country now has 6,012 miles of high-speed rail lines, the most of any country in the world (Railway-Technology.com 2012). On July 23, 2011, a high-speed train rear-ended another high-speed train on a viaduct in Wenzhou, killing 40 people and injuring 72. The crash was caused by the failure of signaling equipment. This equipment was determined to have a flawed design that was not properly identified during its development. The official investigation found that the accident was symptomatic of a lack of emphasis on safety by the management of China's rapidly growing high-speed train industry (Aredy 2011).

## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

### **L010-2**

The Authority would maintain all HST facilities, including the right-of-way and fence, and provide appropriate weed and pest control. Maintenance activities are described in Section 2.6, Operations and Service Plan, of the Final EIR/EIS. The Authority would not be responsible for maintaining lands outside of the project footprint.

Construction Mitigation Measure AVR-MM#1a has been revised as follows: "Any graffiti or visual defacement of temporary fencing and walls will be painted over or removed within 5 business days." Project Mitigation Measures AVR-MM#2f and AVR-MM#2h have been revised as follows: "Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired within a reasonable time after notification."

### **L010-3**

Refer to Standard Response FB-Response-PU&E-03, FB-Response-GENERAL-12.

Existing utilities crossing the HST right-of-way will be maintained during the relocation or protection-in-place of these facilities. Utilities crossing the HST right-of-way underground will be encased in steel casings, and the length of the casing will be extended sufficiently beyond the HST right-of-way so that future access to the casings can be made without affecting the HST right-of-way. The Authority and its contractor(s) will continue to work with the City of Wasco to ensure the design and relocation/protection of utilities meets the requirements of the City.

### **L010-4**

Refer to Standard Response FB-Response-PU&E-03.

The number of high-risk and low-risk utilities is identified in the Revised DEIR/Supplemental DEIS. The document further acknowledges that the project construction contractor would coordinate schedules for utility relocations and protection-in-place with the utility owner, including the City of Wasco, to ensure the project would not result in prolonged disruption of services. The Authority and its contractor(s) will continue to work with the City of Wasco to ensure the design and relocation/protection of utilities meets the requirements of the City. Refer to Section 3.6.5 for further details.

### **L010-5**

Refer to Standard Response FB-Response-AVR-03, FB-Response-AQ-05.

As mentioned in Section 3.7.5.3 of the Revised DEIR/Supplemental DEIS, all vegetation within the right-of-way would be permanently removed. Vegetation removed in temporary construction staging and access areas would be restored after completion of construction activities. The permanent removal of vegetation within the right-of-way is a standard construction practice necessary to minimize ongoing maintenance activities and to ensure the safe operation of the HST System. Mitigation Measures Bio-MM#5 and Bio-MM#6 require the development and implementation of a Biological Resources Management Plan and a Restoration and Revegetation Plan, respectively, which will include terms and conditions as applicable from the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACE), the State Water Resources Control Board (SWRCB), and California Department of Fish and Wildlife (CDFW) permits.

Mitigation Measures AVR-MM#2b, -2c, 2d, 2e, and 2f each provide descriptions of measures that would be applied to minimize vegetation removal and provide new landscape screening.

### **L010-6**

Within the City limits, the HST is on elevated structure spanning approximately 3 miles from Margola Street to Prospect Avenue, reaching a height of 50 feet above the Paso Robles Highway (SR 46). Portions of Wasco Avenue, parallel to the existing BNSF ROW, would be closed. No other closures within the city limits are proposed.

The Authority and design-builder will prepare a detailed Construction Transportation Plan (CTP) for the purpose of minimizing the impact of construction and construction traffic on adjoining and nearby roadways. The CTP will be prepared in close consultation with the City of Wasco, and will be reviewed and approved by the Authority before commencing any construction activities. This plan will address, in detail, the activities to be carried out in each construction phase, with the requirement of maintaining traffic flow during peak travel periods. Such activities include, but are not limited to, the routing and scheduling of materials deliveries, materials staging and storage areas, construction

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## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

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### L010-6

employee arrival and departure schedules, employee parking locations, and temporary road closures, if any. The plan will provide traffic controls pursuant to the California Manual on Uniform Traffic Control Devices sections on temporary traffic controls.

### L010-7

Amtrak service is not proposed to be discontinued in Wasco during construction. The passenger platform in Wasco would be relocated prior to demolition of the existing structure if necessary. During construction, the Authority will coordinate with the appropriate transit jurisdiction(s) before limiting access to public transit and limiting movement of public transit vehicles. Potential actions that would impact access to transit include, but are not limited to, relocating or removing bus stops, limiting access to bus stops or transfer facilities, or otherwise restricting or constraining public transit operations. Public transit access and routing will be maintained where feasible. Upon completion, Amtrak service and local bus/transit operations will not be affected. Refer to Impact TR #10 – Impacts on Regional Transportation System of the Final EIR/EIS.

### L010-8

Refer to Standard Response FB-Response-GENERAL-10.

The HST project is elevated through Wasco as a means to mitigate impacts on vehicular and pedestrian movements by separating them from the HST System; ongoing coordination with the City of Wasco may continue through the design and procurement process.

### L010-9

Refer to Standard Response FB-Response-SO-02.

A comprehensive literature review in Section 5.4.4.3 of the Community Impact Analysis Technical Report (Authority and FRA 2012h) presents research studies conducted on the effect of constructing new commuter rail lines on residential and commercial real estate values. The research was conducted on the property value impacts of different types of rail transit, and the majority of the studies found that rail transit access had a positive influence on residential property values, due to a presumed relationship

### L010-9

between property values and improved accessibility (both of residents to regional jobs and of employers to a larger labor pool). In a study of the property value impacts associated with a variety of disamenities, such as environmental contamination or proximity to linear features like roadways and railroads, Simons (2006) reviewed several rigorous studies (conducted in Ohio, Georgia, and Norway) of the relationship between residential property values and proximity to rail lines, and concluded that there were negative property value impacts in the single digits (e.g. 2 or 3%) for residential properties within 750 feet of an active railroad track.

Although considerable research has been conducted on the property value impacts of rail transit, especially on residential property values near transit stations, no studies were found that examine the specific question of high-speed rail impacts on real estate property values. Therefore, it is not clear how these findings would apply to high-speed rail projects and it is unclear whether the property value impacts would be similar. As a result, a calculation of loss of value of property adjacent to the project would be speculative and, consequently, a quantitative evaluation was not performed at the community or regional level. Community-level analysis was performed to evaluate the economic impact on property tax revenues that would result from the acquisition of land for project construction, the impact on sales tax revenues caused by the relocation of businesses, and the economic impact of project spending. The details of the analyses are presented in Section 5.4.4 of the Community Impact Assessment Technical Report.

### L010-10

Refer to Standard Response FB-Response-SO-01.

Eminent domain is viewed as a last resort, and the Authority plans to be able to reach agreements with all property owners whose land would be affected by the HST project. For more information on the property acquisition and compensation process see EIR/EIS Volume II, Technical Appendix 3.12-A.

### L010-11

The Authority does not have legislative authority to grant, let alone sell, air rights above or beneath its aerial structures. Therefore, the environmental document considers anything within the project footprint to be directly and permanently taken. There may be

## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

### **L010-11**

rare cases in the future when the Authority obtains a variance to grant use of its air space to a second party, but this variance would require review and approval by a separate state agency. Therefore, because the Authority cannot guarantee that it can grant this right, easement, or use, the environmental document conservatively and correctly evaluates the impacts of the permanent removal of any resource that would be located under an elevated guideway.

A depressed section through the city of Wasco would be approximately 2.5 miles long. To develop the land above the HST project would require the train to be placed in a tunnel. Depending on the type of tunneling method used and the soils encountered, the cost of a tunnel is approximately \$183 million to \$280 million/mile. The cost of the elevated structure through Wasco is approximately \$63 million/mile. Therefore, placing the HST in a trench through Wasco would increase the cost of this section by at least approximately \$300 million. It is unlikely that the revenue obtained from development would be equal to or greater than this cost.

### **L010-12**

Refer to Standard Response FB-Response-SO-03.

Impacts, both permanent and temporary construction-related, to the City of Wasco's business district are evaluated and documented in EIR/EIS Volume I Section 3.12, Impact SO#10, for business relocation by community. Also, for details on the business analysis, including type of businesses affected, vacancies, and number of employees potentially impacted, see Section 5.2.3 of the Community Impact Assessment Technical Report (Authority and FRA 2012h).

### **L010-13**

Refer to Standard Response FB-Response-GENERAL-05, FB-Response-GENERAL-15.

The analysis of potential job loss associated with residential and business displacement and relocation was performed for each route alternative and the results are presented in EIR/EIS Volume I Section 3.12 (Impact SO #9, SO #10, and SO #11). It is unforeseeable where each individual displaced business owner would relocate to; however, a gap analysis of available properties was performed for the displaced

### **L010-13**

residents and relocated businesses and the results showed that there are suitable replacement locations in the City of Wasco and the surrounding area. See the Draft Relocation Impact Report (Authority and FRA 2012i) for the complete analysis.

The HST Project will also result in new job creation, and for the resulting impacts on the regional economy see EIR/EIS Volume I Section 3.12 Impact SO #13. Also see Section 5.1.2 of the Community Impact Assessment Technical Report (Authority and FRA 2012h) for more detailed information on short-term and long-term job creation. The location of each job and city of residence of each employee is indeterminable at this time.

### **L010-14**

Refer to Standard Response FB-Response-SO-07, FB-Response-GENERAL-23.

According to EO 12898, the offsetting benefits associated with the project should be considered as part of the environmental justice analysis. The project would provide benefits that would accrue to all populations, including communities of concern. These benefits would include improved mobility within the region, improved traffic conditions on freeways as modes divert to HST, improvements in air quality within the region, and new employment opportunities during construction and operation.

Jobs created by construction and operation of the project would likely be filled by workers in the region. To help offset any disproportionate effects, the Authority has approved a Community Benefits Policy that supports employment of individuals who reside in disadvantaged areas and those designated as disadvantaged workers, including veterans returning from military service. It helps to remove potential barriers to small businesses, disadvantaged business enterprises, disabled veteran business enterprises, women-owned businesses, and microbusinesses that want to participate in building the High-Speed Rail system.

Under the Authority's Community Benefits Policy, design-build construction contracts will be required to adhere to the National Targeted Hiring Initiative, which states that a minimum of 30 percent of all project work hours shall be performed by national Targeted Workers and a minimum of 10 percent of National Targeted Workers' hours shall be

## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

### L010-14

performed by disadvantaged workers. According to the National Targeted Hiring Initiative, disadvantaged workers either live in an economically disadvantaged area or face any of the following barriers to employment: being homeless, being a custodial single parent, receiving public assistance, lacking a GED or high school diploma, having a criminal record or other involvement with the criminal justice system, being chronically unemployed, being emancipated from the foster care system, being a veteran, or being an apprentice with fewer than 15 percent of the required graduating apprenticeship hours in a program. The Community Benefits Policy will supplement the Authority's Small Business Program, which has an aggressive 30 percent goal for small business participation. That small business participation goal includes goals of 10 percent for disadvantaged business enterprises and 3 percent for disabled veteran business enterprises.

Travel via the HST system will be less expensive than air travel over the same distance, by business design. As a result, it will be affordable to a larger segment of the population than air travel.

Although it is not possible to say how many Wasco residents will work directly for the HST project, some of the indirect and induced jobs created by the HST will be filled by residents in Wasco. Indirect employment refers to the jobs created in existing businesses in the project area (e.g., material and equipment suppliers) that supply goods and services to project construction. Materials such as gasoline, oil, parts, and light bulbs will be purchased locally. Induced employment refers to the jobs created in new or existing businesses in the project area (e.g., retail stores, gas stations, banks, restaurants, service companies) that supply goods and serves to construction workers and their families. Due to Wasco's proximity to the BNSF (through Wasco) and Wasco-Shafter Bypass alternatives, indirect and induced employment will occur in the city, although the exact number of jobs is unknown.

Additionally, project spending on local expenditures will result in increased sales tax revenues for the City of Wasco. Construction- and operation-related sales tax gains are examined in Section 5.4.6 of the Community Impact Assessment Technical Report (Authority and FRA 2012h).

### L010-15

Refer to Standard Response FB-Response-GENERAL-06, FB-Response-GENERAL-12, FB-Response-GENERAL-18.

Amtrak service and associated jobs in Wasco will be maintained. For information on the HST operation-related property and sales tax revenue effects see EIR/EIS Volume I Section 3.12 Impact SO #3, Impact SO #4, and Impact SO #12. For information on the ticket prices see the Authority's Business Plan (Authority 2012a). See Section 5.1.2 in the Community Impact Assessment Technical Report (Authority and FRA 2012h) and EIR/EIS Volume I Section 3.12, Impacts SO #5 and SO #13, for information on project job creation during construction and operation. For information on local job training programs and contracting opportunities please visit the California High-Speed Rail Authority website for more information.

### L010-16

Refer to Standard Response FB-Response-GENERAL-02.

The visual impacts of the alternative project alignments in Wasco, including elevated segments, are identified in Section 3.16.5.3 of the Revised DEIR/Supplemental DEIS. In particular, see the section titled "Rural Town Landscape Units (Corcoran, Wasco, and Shafter)." Impacts on rural areas under the Wasco-Shafter Bypass Alternative are discussed in the Revised DEIR/Supplemental DEIS for this and other affected rural areas of the San Joaquin Valley in the section titled "Wasco-Shafter Bypass Alternative" of the Revised DEIR/Supplemental DEIS.

The effects of the overhead contact system (OCS) are discussed in the Revised DEIR/Supplemental DEIS, which acknowledges that the OCS would have an industrial character that would contrast with rural settings, particularly as seen at foreground distances. The OCS would be visible in downtown Wasco, where open view corridors to the guideways exist. However, beyond 0.25 mile, these features would not be visually apparent. At that distance, they would be indistinct and have minimal impact (even at somewhat closer distances). The presence of the OCS was incorporated in the overall analysis of impacts in Wasco, as suggested in the simulation in Figure 3.16-44, which depicts the appearance of the OCS at a distance of approximately 250 feet from the

## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

### **L010-16**

alignment centerline.

Measures to reduce visual impacts on the community in Wasco under each alternative are identified in Table 3.16-5. These mitigation measures include AVR-MM#2a, #2b, #2c, #2d, #2e, #2f, and #2g.

### **L010-17**

The California Intercity High-Speed Rail Commission analyzed three types of HST technology for the Statewide Program EIR/EIS. These technologies included Steel-Wheel-on-Steel-Rail at Lower Speed (below 200 miles per hour [mph]); Magnetic Levitation Technology (maglev); and Steel-Wheel-on-Steel-Rail at Very High Speed (VHS) (above 200 mph). The Authority's enabling legislation, Senate Bill (SB) 1420 (chaptered September 24, 1996, Chapter 796, Statute of 1996), defines high-speed rail as "intercity passenger rail service that utilizes an alignment and technology that makes it capable of sustained speeds of 200 mph (320 kph [kilometers per hour]) or greater." Technologies below 200 mph were therefore eliminated from further consideration. This direction is consistent with foreign HST experience, the experience of the northeast corridor (Boston–New York–Washington, D.C.), and HST studies done elsewhere in the United States, which show that to compete with air transportation and generate high ridership and revenue, the intercity HST travel times between the major transportation markets must be below 3 hours. From this determination, the Commission directed staff to focus technical studies on Steel-Wheel-on-Steel-Rail at VHS (above 200 mph) and maglev technologies. Although a completely dedicated train technology using a separate track/guideway would be required on the majority of the proposed system for both technologies, requiring such separation everywhere in the system would prohibit direct HST service to certain heavily constrained terminus sections (e.g., the San Francisco Peninsula from San Jose to San Francisco and the existing rail corridor between Los Angeles Union Station and Orange County). Because of extensive urban development and severely constrained right-of-way, HST service in these terminus sections would need to share physical infrastructure (tracks) with existing passenger rail services in existing or slightly modified corridors. A maglev system, in addition to being a more costly technology, requires separate and distinct guideway configurations that preclude the sharing of rail infrastructure. Because a dedicated (exclusive guideway) high-speed rail service along existing right-of-way corridors in all segments of the system would be

### **L010-17**

infeasible, use of maglev technology for portions of the project would preclude direct HST service without passenger transfer and would not satisfy the travel time requirements of the project purpose and need. Other rail transportation configurations, including monorail, were eliminated from further consideration for not meeting this basic system requirement. A VHS system would be compatible with other trains sharing the tracks. The potential for utilization of shared track allows for individual project segments to meet independent utility requirements. By comparison, maglev technology does not lend itself to incremental improvements and could not satisfy the independent utility requirements or meet the project's blended system approach. By taking advantage of the existing rail infrastructure, a shared-use configuration would be mostly at-grade. Shared-use options are less costly and would result in fewer environmental impacts compared with exclusive guideway options. Also, improved regional commuter service (electrified, fully grade-separated, with additional track and security features) will help mitigate the impacts along existing rail corridors. Shared-use improvements in these corridors would potentially improve automobile traffic flow at rail crossings and reduce noise impacts, because a grade-separated system could eliminate trains blowing warning horns throughout the alignment. Shared-use options would provide the opportunity for a partnership with right-of-way owners and commuter rail operators and would provide the opportunity to incrementally improve network segments. For these reasons, maglev technology was eliminated from further investigation in the Final Program EIR/EIS, is not part of the project description, and does not require further consideration in this project-level EIR/EIS.

Placing the HST project in a trench or tunnel through Wasco was determined to be not practicable. A trench with vertical sides would need to be approximately 40 feet deep for the HST project to be fully depressed. The cost of such a trench would be approximately \$121 million/mile. The cost of a tunnel would depend on the tunneling method and the soils encountered, but is estimated to vary from \$183 million/mile to \$280 million/mile. The cost of the elevated structure through Wasco is approximately \$63 million/mile. The trench or tunnel required to pass through Wasco would be approximately 2.5 miles long. Therefore, using a trench would increase the project cost by approximately \$145 million. Using a tunnel would increase the project cost by approximately \$300 million to \$540 million. These costs made a trench or tunnel impracticable.

## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

### **L010-18**

Refer to Standard Response FB-Response-GENERAL-02.

The effects of the widened rail right-of-way were considered in the overall analysis of impacts in Wasco. The addition or relocation of tracks in this corridor, currently occupied by six parallel sets of tracks, could cause an incremental increase in the visibility of the freight rail tracks, but the difference would be subtle and little noticed by casual observers. The relocated tracks would be seen against the visual background of the existing rail tracks and associated industrial facilities and would have a minor effect on the visual quality of these views.

Only one grade separation is proposed in Wasco under the Wasco-Shafter Bypass Alternative, on State Route (SR) 46. This overcrossing could affect one residence at the western touchdown; this overcrossing would be essentially of the type described in paragraph 3 of "San Joaquin Valley Rural/Agricultural Landscape Unit" in the Revised DEIR/Supplemental DEIS. Mitigation for instances of this impact type are described in Mitigation Measure AVR-MM#2f, which calls for landscape treatments at such overcrossings.

Construction impacts are discussed generally under "Construction-Period Impacts" in Section 3.16.5.3, High-Speed Train Alternatives, of the Revised DEIR/Supplemental DEIS. Mitigation for these impacts are described under Mitigation Measures AVR-MM#1a and #1b in Section 3.16.7.1 of the Revised DEIR/Supplemental DEIS. Mitigation Measure AVR-MM#2c calls specifically for extensive landscape screening adjacent to affected residential areas. Mitigation Measures AVR-MM#2b, #2d, #2e, and #2f each provide measures for landscape screening as required to mitigate different situations. Mitigation Measure AVR-MM#2c calls for the Authority to work with affected cities to develop site and landscape plans for areas disturbed by the project.

All anticipated components of the project, including safety fences and walls, were included in the impact assessments described in the Revised DEIR/Supplemental DEIS. Mitigation Measures AVR-MM#2f and #2g specifically address mitigation of impacts from retained-fill walls and sound walls, respectively. Measures #2b and #2d are specifically aimed at integrating the rights-of-way and providing attractive open

### **L010-18**

space treatments, particularly in areas affected by the presence of guideways.

Accurately scaled, photorealistic 3D computer visualization was used to produce the simulations presented in the Revised DEIR/Supplemental DEIS. The computer models were based on the 15% engineering design and related Authority technical design documents. Animations were not produced, because they are not a typical component of the preparation of a CEQA/NEPA document. Visualization of potential future development was not represented and is not typically depicted in a CEQA/NEPA document, where these developments are not part of the proposed project or, as in this case, are speculative.

### **L010-19**

Refer to Standard Response FB-Response-GENERAL-05, FB-Response-GENERAL-10.

For information on the disruption to existing communities, including Wasco, see EIR/EIS Volume I Section 3.12, Impact SO #6, and see the related mitigation measure SO-1 for measures to reduce impacts associated with the division of rural communities.

### **L010-20**

Refer to Standard Response FB-Response-SO-02, FB-Response-LU-04.

The use of the land adjacent to the HST alignment is not expected to change except in the station areas where the station can act as an economic catalyst for transit-oriented development and in agricultural areas where agricultural uses would be displaced and parcel severance may remove from production some land that is currently in agricultural use. Refer to Section 3.13, Station Planning, Land Use, and Development, for complete information on transit-oriented development and for information on the policies and local regulations that are currently in place in the station areas. For areas outside the station area, remaining land or reduced parcel sizes would be returned to uses consistent with local land use plans at the discretion of the local cities and counties.

For information on potential HST project impacts on property values, see Section 5.4.4.3 in the Community Impact Assessment Technical Report. Owners who believe they have suffered a loss of property value as a result of the project may file a claim with the State

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## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

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### **L010-20**

of California's Government Claims Board. More information may be obtained online at [www.vcgcb.ca.gov/claims/](http://www.vcgcb.ca.gov/claims/).

### **L010-21**

The Authority does not have legislative authority to grant, let alone sell, air rights above or beneath its aerial structures. Therefore, the environmental document considers anything located within the project footprint to be directly and permanently taken. There may be rare cases in the future when the Authority obtains a variance to grant use of its air space to a second party, but this variance would require review and approval by a separate state agency. Therefore, because the Authority cannot guarantee that it can grant this right, easement, or use, the environmental document conservatively and correctly evaluates the impacts of the permanent removal of any resource that would be located under an elevated guideway.

### **L010-22**

A station is not proposed for Wasco and is not part of the project components; therefore, there is no requirement to include an analysis of a station in Wasco in the Revised DEIR/Supplemental DEIS.

### **L010-23**

Mitigation Measure AVR-MM#2a in Section 3.16, Aesthetics and Visual Resources, of the Final EIR/EIS calls for incorporating local design criteria into elevated and station elements of the proposed project. AVR-MM#2a states, "For elevated guideways in cities or unincorporated communities: During the elevated guideway design process, establish a process with the city or county with jurisdiction over the land along the elevated guideway to advance the final design through a collaborative, context-sensitive solutions approach. Participants in the consultation process will meet on a regular basis to develop a consensus on the urban design elements that are to be incorporated into the final guideway designs. The process will include activities to solicit community input in the affected neighborhoods."

### **L010-24**

Refer to Standard Response FB-Response-GENERAL-12.

### **L010-24**

The impact on the Wasco Amtrak station building will depend on which alternative is selected: the BNSF Alternative through Wasco, or the Wasco-Shafter Bypass Alternative. The BNSF Alternative would require the relocation of the Wasco Amtrak station building. If selected, relocation would be completed before demolition of the existing station building to ensure that the city of Wasco experiences no disruption in Amtrak service.

### **L010-25**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-12, FB-Response-GENERAL-13.

### **L010-26**

Refer to Standard Response FB-Response-GENERAL-12.

If the BNSF Alternative is selected as the preferred alternative, the Wasco Amtrak station building would be relocated before demolition of the existing structure to ensure that the city of Wasco experiences no disruption in Amtrak service.

### **L010-27**

Amtrak service is not proposed to be discontinued in Wasco. The passenger platform in Wasco would be relocated prior to demolition of the existing structure, if necessary.

### **L010-28**

The transit station would need to be relocated, along with the Amtrak station.

### **L010-29**

The Authority does not have air rights for land uses under an elevated section of the HST project. Those rights must be provided by the State Legislature, which has not yet provided them. Uses under elevated sections of the HST System will be limited to the uses of the Authority and will not include private development. In general, no development (other than landscaping or other aesthetic treatments) will occur under the guideway. Mitigation Measures AVR-MM#2a through AVR-MM#2f describe how the

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## Response to Submission L010 (Dan Allen, City of Wasco, September 10, 2012) - Continued

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### **L010-29**

Authority will work with the community to reduce the impacts of the elevated guideways on aesthetics. These mitigation measures will ensure that the Authority's use of the areas beneath the guideways will be developed to reflect the neighborhood context.

### **L010-30**

Construction of a Wasco to Bakersfield bike trail adjacent to the HST right-of-way is not a proposed project activity for the Fresno to Bakersfield Section of the HST System, and therefore is not analyzed in the Fresno to Bakersfield Section Revised DEIR/Supplemental DEIS.

Submission L011 (Dan Allen, City of Wasco, October 17, 2012)



City of Wasco (661) 758-7214 Fax (661) 758-1728  
764 E. Street, Wasco, CA. 93280

October 18, 2012

**BY MAIL/EMAIL**

Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment  
770 L. Street, Suite 800  
Sacramento, CA. 95814

**RE: Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Revised Comment Period.**

L011-1

The City of Wasco appreciates this opportunity to submit additional comments on the Revised Draft EIR/EIS. The following comments are based on our continuing review of the draft document and the potential impacts of the proposed HST alignment through the City on our businesses, residents and infrastructure.

It is difficult for us to make specific comments on impacts and mitigations as the project currently has a fairly low level of design (stated as 15%) and a preferred alignment has not yet been selected. This may also be a benefit as we believe the proposed alignment through our City should be an east side alignment relative to the BNSF Rail corridor. In fact, in discussions with Jeff Morales and Dan Richard it was indicated that Authority's legal counsel felt that the BNSF Alternative could be considered as a "corridor" with the potential to locate the HST alignment on either the west or east side of the BNSF rail corridor.

L011-2

*With this letter the City would like to state that if the BNSF Alternative is chosen through the City of Wasco we request that the alignment be on the east side on the BNSF rail lines through our downtown area.* We believe the east side alignment can be accomplished without impacting the BNSF facilities, can potentially be constructed at-grade, and would clearly have less significant impacts on important businesses, employment and residents, and would avoid any conflicts with our existing Amtrak and city operated transit facilities. We believe that if an at-grade alignment could be accomplished there would also be construction cost savings to the project.

We are requesting that additional wording be included in the draft EIR/EIS that identifies this "corridor" definition for the BNSF Alternative as described more fully below. We are also concerned that the EIR/EIS seems to dismiss an at-grade alignment through Wasco, stating impacts to roads and BNSF rail operations. This assertion needs supporting justification as we believe an at-grade alignment through Wasco may be possible without impacting BNSF rail operations. Depending on which alignment is finally selected through our city, with this letter we are identifying the mitigations that will be necessary to mitigate the significant impacts that will result from an alignment through the City's downtown area.

Page | 1



L011-3

**2.4.2 BNSF Alternative**

The BNSF Alternative description should be amended to recognize this alternative as a "corridor" with the potential for the HST alignment to be on either the west or east side of the BNSF rail line. Suggested wording (underlined) to amend the first paragraph to accomplish this follows:

This section provides a detailed description of the BNSF Alternative. The 15% design drawings showing the track alignments, profiles, structures, typical sections, construction use areas, and other preliminary design information are included as Volume III of the EIR/EIS. However, for the purposes of the environmental analysis and identification of impacts and mitigation measures, the BNSF Alternative is considered to be a corridor along the BNSF rail right-of-way, and the HST alignment may be along the west side or east side of the BNSF rail right-of-way. The description of this alternative in Sub-section 2.4.2.3, North-South Alignment, makes certain assumptions regarding the horizontal and vertical alignment, but as a "corridor" the final alignment may follow either the western or eastern side of the BNSF railway and may be either elevated or at-grade depending on more detailed design development.

L011-4

**2.3.2 Range of Potential Alternatives Considered and Findings**

Suggested wording to address the potential for an at-grade alignment through Wasco follows:

Under Sub-section 2.3.2.2 Rural Subsection, page 2-25, third paragraph:

While both at-grade and elevated alignment options are carried forward through Corcoran, ~~the major potential~~ impacts on the road networks and BNSF Railway operations and facilities in Wasco and Shafter ~~made make~~ an at-grade alignment through these cities ~~impracticable more problematic~~. However, if an at-grade alignment which does not impact the BNSF operations can be developed it may be considered a possible option.

L011-5

**Mitigation Measures**

The HSR project shall be responsible for the following mitigation measures within the City of Wasco:

1. All existing road crossings to be re-constructed as grade separations.
2. All roadway grade separations to be constructed to ultimate street design width per City's master plan of circulation.
3. If the HST crosses Highway 46 at-grade, the grade-separation shall be constructed as an underpass for Highway 46 at a width and design per Segment 3 of Caltrans Project

Page | 2

Submission L011 (Dan Allen, City of Wasco, October 17, 2012) - Continued



- L011-5 | Report (06-Ker-46-PM 46.00/51.2206225-418800 RIP 075.600, Oct. 2006) for Highway 46 improvements.
- L011-6 | 4. All impacted infrastructure facilities, including sewer, water, drainage and wells, shall be relocated and reconstructed to City requirements.
- L011-7 | 5. Construct a pedestrian bridge crossing the HST and BNSF rail facilities along the 6<sup>th</sup> Street alignment.
- L011-8 | 6. Relocate the City of Wasco Housing Authority Farm Labor Housing development to a location within the city on the west side of the BNSF rail right-of-way.
7. The existing Amtrak station, platform and adjacent City operated transit station, if impacted by the HST alignment, shall be relocated and reconstructed to provide equal passenger access service as currently exists.

Again, we appreciate the opportunity to work with the High Speed Rail Authority on designing and implementing a project that will serve the broader State's transportation needs, but is accomplished in a manner that minimizes the impacts to local communities such as Wasco.

Sincerely,

Dan Allen



City Manager  
City of Wasco

## Response to Submission L011 (Dan Allen, City of Wasco, October 17, 2012)

### L011-1

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-08.

The Preliminary Alternatives Analysis Report studied the HST alternatives through Wasco on both the western and the eastern sides of the BNSF right-of-way.

The Wasco/Shafter Through-Town At-Grade Option (CTT2A) would travel on the eastern side of the BNSF right-of-way and was withdrawn during the Preliminary Alternatives Analysis process because it would be a major intrusion through a small community and result in extensive commercial displacements; loss of road network connectivity; and costly and complex construction. This alignment would also have major impacts on the BNSF Railway sidings and spurs and require grade separations that would have major impacts on the existing roadway network. This alignment would require relocation of the existing Amtrak station platform and pass near an agricultural workers' compound, which could raise Environmental Justice issues.

Two alternatives were carried forward for further analysis in the EIR/EIS for the Fresno to Bakersfield Section. The Wasco/Shafter Through-Town Elevated Option (CTT2B) (carried forward as the BNSF Alternative) would travel on the western side of the BNSF right-of-way. The Wasco/Shafter At-Grade East Bypass (CTT2D) (carried forward as the Wasco-Shafter Bypass Alternative) would bypass both cities to the east.

For more information, please see the Preliminary Fresno to Bakersfield Alternatives Analysis Report (June 2010) available on the Authority's website.

An EIR project description is intended to be general, not detailed (CEQA Guidelines § 15124[c]). Final design or even advanced design of infrastructure is not required in the project description (Dry Creek Citizens Coalition v. County of Tulare [1999]) 70 Cal.App.4th 20, 36). The question is whether the project description narrowed the scope of environmental review, or prevented full understanding of the project and its consequences (Ibid.).

Abundant substantive evidence in the record demonstrates that the project description was more than adequate for the environmental analysis of the project. The term "15% design" is an engineering term of art that refers to the level of engineering prepared for

### L011-1

the HST project elements for the EIR. The 15% design generates detailed information, like the horizontal and vertical locations of track, cross sections of the infrastructure with measurements, precise station footprints with site configuration, and temporary construction staging sites and facilities. The 15% design also yields a "project footprint" overlaid on parcel maps, which shows the outside envelope of all disturbance, including both permanent infrastructure and temporary construction activity. This 15% design translated into a project description in the EIR with 100% of the information that is required under CEQA Guidelines Section 1512447 (see Dry Creek, supra, 70 Cal.App.4th at pp. 27-36 [upholding EIR conceptual project description as inadequate when based on preliminary design]).

A higher level of design is not necessary because 15% design provides enough information for a conservative environmental analysis. A higher level of design provides refinement, but does not yield more information needed for adequate CEQA review. For example, if a lead agency knows the location, size, and basic design of a building, it has enough information for environmental review. The details about whether the water system will use PVC or copper pipe or whether the windows will be vinyl or wood are not necessary for assessing the impacts of building construction. Further, it is common practice with larger transportation infrastructure projects to prepare the environmental analysis before the completion of the final design.

### L011-2

Locating the HST project at-grade on the east side of the BNSF Railway would have substantial impacts on existing railroad facilities. Because the BNSF is a common carrier, it may not be possible to relocate its facilities if they chose not to participate. It is recognized that the HST alternative on the west side of the BNSF Railway would substantially impact the principal commercial/industrial businesses in Wasco.

### L011-3

The requested change cannot be made because the environmental analysis included in this EIR/EIS has been conducted on an alignment that would be elevated on the west side of the BNSF Railway through Wasco.

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## Response to Submission L011 (Dan Allen, City of Wasco, October 17, 2012) - Continued

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### L011-4

The requested change cannot be made because the environmental analysis included in this EIR/EIS has been conducted on an alignment that would be elevated on the west side of the BNSF Railway through Wasco.

### L011-5

The City of Wasco has the potential to be affected by the BNSF Through-Wasco Alternative; however, the HST is proposed to be located on an elevated structure from First Street for a distance of about 3 miles and return to grade north of Kimberlina Road. No roads are proposed to be closed, and all crossings will be grade-separated.

### L011-6

Refer to Standard Response FB-Response-PU&E-03.

For public utilities like sewer, water, and storm drains, public/municipal design guidelines and specifications will be employed in any relocation. Agreements would be negotiated with each affected jurisdiction to ensure that the requirements and standards of each jurisdiction are followed during utility relocations. The Authority will require additional protective measure (i.e., casing and clearances) as defined in their technical memorandums to ensure protection of the HST facilities.

### L011-7

The BNSF Alternative would be located on an elevated structure when crossing 6th Street, and therefore would have to be grade-separated from pedestrian crossings.

### L011-8

Refer to Standard Response FB-Response-GENERAL-12, FB-Response-SO-01.

The alternative that is selected for the Wasco area -- either the BNSF Alternative or the Wasco-Shafter Bypass Alternative -- will determine the specific impacts to these resources in Wasco. Decisions about the relocation of displaced residences will be made during the property acquisition phase; for more information see EIR/EIS Volume II Technical Appendix 3.12-A. If the Wasco Amtrak station building would be displaced by the project it would be relocated to minimize service interruptions and maintain current

### L011-8

operational levels. This issue has been identified as a special relocation consideration in the Draft Relocation Impact Report (Authority and FRA 2012i), Section 6.4.3.1.

Submission L012 (Jim Wadsworth, Corcoran City Council, October 19, 2012)

Fresno - Bakersfield (July 2012+) - RECORD #382 DETAIL

**Status :** Action Pending  
**Record Date :** 10/19/2012  
**Response Requested :** No  
**Stakeholder Type :** Government  
**Affiliation Type :** Local Agency  
**Interest As :** Local Elected  
**Submission Date :** 10/19/2012  
**Submission Method :** Project Email  
**First Name :** Jim  
**Last Name :** Wadsworth  
**Professional Title :** Member Corcoran City Council  
**Business/Organization :** Corcoran City Council  
**Address :**  
**Apt./Suite No. :**  
**City :** Corcoran  
**State :** CA  
**Zip Code :** 93212  
**Telephone :**  
**Email :** jwadsworth@jgboswell.com  
**Email Subscription :**  
**Cell Phone :**  
**Add to Mailing List :**  
**Stakeholder** Speaking as one member of the Corcoran City Council, not on behalf of  
**Comments/Issues :** the City council.  
I am against the High Speed Train being constructed through the City of  
Corcoran. Two of the proposed alignments, the BNSF Alternative (C3)  
and  
Elevated alternative (C1) will create long terms noise impacts - leading  
to potential health problems; long term aesthetic impacts, and will  
detrimentally affect the quality of life in our small rural community.  
As noted in the Revised Draft EIR/ Supplemental Draft EIS, none of  
these  
impacts can be fully mitigated.  
  
James G. Wadsworth  
Member Corcoran City Council  
  
**EIR/EIS Comment :** Yes  
**Official Comment Period :** Yes

L012-1

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## Response to Submission L012 (Jim Wadsworth, Corcoran City Council, October 19, 2012)

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### L012-1

Refer to Standard Response FB-Response-GENERAL-14.

Your opposition to the project is noted.

Three alternatives are proposed in the vicinity of Corcoran: the BNSF Alternative (west side of the BNSF Railway corridor), the Corcoran Bypass Alternative, and the Corcoran Elevated Alternative (east side of the BNSF Railway corridor). Each alternative would have its own set of different effects.

The Authority used the information in the Final EIR/EIS and input from the agencies and public to identify the Preferred Alternative. The decision included consideration of the project purpose, need, and objectives, as presented in Chapter 1, Project Purpose, Need, and Objectives; the objectives and criteria in the alternatives analysis; and the comparative potential for environmental impacts. The Preferred Alternative balances the least overall impact on the environment and local communities, cost, and the constructability constraints of the project alternatives evaluated. The Preferred Alternative is identified and discussed in the Final EIR/EIS.

Submission L013 (Carlo Wilcox, Corcoran Irrigation District, October 19, 2012)

**DIRECTORS**

JESS V. HANSEN, PRESIDENT  
MICHAEL A. FOYETT  
DOUGLAS DEVAINEY  
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SECRETARY - ASSESSOR  
AND TAX COLLECTOR

**Corcoran Irrigation District**

P.O. BOX 566 - CORCORAN, CALIFORNIA 95212  
TELEPHONE (559) 992-5165 - FAX (559) 762-7227

October 18, 2012

California High-Speed Rail Authority  
Fresno to Bakersfield Revised Draft EIR/  
Supplemental Draft EIS Comment  
770 L Street, Suite 800  
Sacramento, CA 95814

Re: Draft EIR/EIS Comments

Gentleman:

The Corcoran Irrigation District (CID) is a California Irrigation District. The District provides irrigation water to 42,000 acres of prime agricultural land located in Kings County in the area east and northeast of the historic Tulare Lake Basin in townships 20, 21 and 22 south and ranges 20 and 21 east. The District boundaries extend from Kansas Avenue to the north, Tucson Avenue to the south, the Kings-Tulare County line on the east and 10th Avenue to the west.

The District is providing the following comments with respect to the Revised Draft EIR/Supplemental Draft EIS Fresno to Bakersfield report dated July, 2012 to make clear to the California High Speed Rail (CaHSR) project the Corcoran Irrigation District irrigation water delivery works, the capacities and access requirements of the Corcoran Irrigation District (CID) so that the CaHSR may perform the tasks it must accomplish without interfering with the operation of the District and the timely delivery of irrigation water to the landowners in the District who depend on that water for their livelihoods. The District provides substantially all of the irrigation water required by the growers in the District. Almost no landowners in the District own or operate irrigation wells. Landowners in the District rely on the District to provide their entire irrigation water supply. CID delivers irrigation water to acreage in the District each and every month of the year. Careful coordination is mandatory to avoid interruptions in delivery of irrigation water and the economic losses that would result if irrigation water is not delivered in suitable quantities and in a timely basis to the growers such that the District's growers may optimize crop production.

The facilities of concern are discussed beginning from the north portion of the CID and working toward the south portion of the District. The comments that follow are provided for the various CaHSR alignments and the specific alignment addressed is referenced in the discussion.

1. The northern most canal in the District that is affected by the CaHSR K2 alignment is the McCann #1 ditch. The McCann #1 ditch carries 50 to 60 cubic feet per second (cfs) from the east to property located on the west side of the BNSF railroad tracks. The canal is located along the north side of sections 20 and 21, T20S, R22E. The canal crosses under the BNSF railroad tracks slightly south and 1/8th miles east of the northwest corner of section 20, T20S, R22E (near HSR station 2417+80) as shown on CaHSR drawing CB 1068, sheet 9 of 14, and continues in a southeasterly direction along the west side of the existing BNSF right of way and parallel to the BNSF right of way until it reaches the

MEMBER, ASSOCIATION OF CALIFORNIA WATER AGENCIES

L013-2

Cross Creek near the south quarter corner of section 20 near station 2459+00 on the same drawing. The CaHSR route and the present location of the McCann #1 Ditch overlap. At the location where the ditch crosses under the CaHSR, CID will require a minimum of a 60 inch diameter reinforced concrete pipe or an engineered reinforced concrete box with ample cross sectional area to carry the design capacity of the ditch. The crossing under the rail line needs to extend a minimum of 40 feet outside of the rail right of way on both sides so that District canal tenders, maintenance personnel and equipment, including road graders, can turn around at the intersection of the canal and the railroad right of way to travel and perform work in the opposite direction rather than have to travel long distances in reverse, which is a significant safety hazard for District employees. Depending where the proposed CaHSR is located, a portion of the District's McCann #1 canal will need to be relocated. This relocation will require taking prime farm land from adjacent landowners on which to locate the canal.

CaHSR drawing CB 1107 for the K3 alignment shows the rail system crossing the McCann #1 ditch at approximately station 2548+50. The canal capacities are as indicated above. The District must have the ability to pass under the rail or as indicated above, the ability to turn around outside of the area of the CaHSR right of way when canals are tended and maintenance is done. This is a safety matter as backing heavy equipment long distances is hazardous and invites accidents.

CaHSR drawing CB 1137 for the K4 alignment shows the rail system crossing the District's McCann #1 ditch at approximately station 2449+40. The canal capacities are as indicated above. The District must have the ability to pass under the rail or as indicated above, the ability to turn around outside of the area of the CaHSR right of way when canals are tended and maintenance is done. This is a safety matter as backing heavy equipment long distances is hazardous and invites accidents.

L013-3

2. The next location of concern is where the California High Speed Rail crosses the Cross Creek (station 2459+00 on the K2 alignment). The Cross Creek is a natural channel that carries runoff water from the Saint Johns River as well as several other creeks and sloughs that contribute water from the Sierra Nevada, the foothills and rainfall in the valley floor into the Kaweah and Saint John's Rivers watersheds and ultimately into the creek. The capacity of the Cross Creek at the location where the California High Speed Rail will cross is in excess of 2,500 cfs. Regardless which alignment is chosen, the Kaweah Delta Water Conservation District is the local agency responsible for the operation and maintenance of the Cross Creek.

L013-4

3. The McCann #2 Ditch currently delivers irrigation water from District facilities located east of State Highway 43. The canal is located on the north section line of section 28, T20S, R22E, then the canal jogs to the south for 1/4 mile where it turns to the southwest and terminates on the west side of the existing BNSF railroad bed. It is unclear where and how the new California High Speed Rail route will impact both the McCann #2 ditch and/or the adjacent property owner. Depending on the location of the CaHSR, the ditch will have to be extended to the west to serve the property historically served in section 29 T20S, R22E. The capacity of the McCann #2 ditch is 10 cfs and the plumbing will need to be sized appropriately. The McCann #2 Ditch is located at Station 2507+50 on CaHSR drawing CB 1069, sheet 10 of 14 for the K2 alignment.

CaHSR drawing CB 1109 for the K3 alignment shows the rail system crossing the District's McCann #2 ditch at approximately station 2539+50. The canal capacities are as

Submission L013 (Carlo Wilcox, Corcoran Irrigation District, October 19, 2012) - Continued

L013-4

indicated above. The District must maintain its ability to operate and perform maintenance on the ditch without interference from the CaHSR. The safety of District canal tenders and maintenance personnel is paramount.

CaHSR drawing CB 1139 for the K4 alignment shows the rail system crossing the District's McCann #2 ditch near its terminus at approximately station 2540+50. The canal serves a District landowner who farms in section 29 T20S, R22E and the connection will need to be restored.

L013-5

4. The west branch of the Lakelands Canal crosses under State Highway 43 and the BNSF railroad bed near the CaHSR station 2552+00 shown on CaHSR drawing CB 1070, sheet 11 of 14 for the K2 alignment in Section 33 T20S, R22E. The west branch of the Lakeland Canal carries 250 cfs. The crossing under Highway 43 currently consists of two 60 inch diameter reinforced concrete pipes and two 42 inch diameter reinforced concrete pipes. Where the west branch of the Lakeland Canal crosses under the California High Speed Rail bed a minimum of three 60 inch diameter reinforced concrete pipes or an engineered concrete box or combination of box culverts with a total cross section of not less than 60 square feet will be required. Larger if the length is such that the new delivery works increases the water level upstream. The topography in the area is very flat and head pressure to move water is limited. As indicated for the previous canal crossings, the crossing under the CaHSR right of way must extend a minimum of 40 feet outside of the rail right of way so that canal tenders and maintenance equipment can make a "U turn" and either continue to perform maintenance or travel back on the opposite bank of the west branch of the Lakeland Canal without having to travel in reverse in the maintenance equipment, which is a safety hazard.

CaHSR drawing CB 1110 for the K3 alternative shows the rail system crossing the District's west branch of the Lakelands Canal at approximately station 2584+40. The canal capacities are as indicated above. The CaHSR will need to enclose the open portion of the west branch of the Lakelands Canal as indicated above to a location to the west of the CaHSR right of way. The District must maintain its ability to turn around on the west side of the CaHSR right of way so that canals may be tended and maintained. This is a safety matter as backing heavy equipment long distances is hazardous and invites accidents. This area will become congested with the state highway and CaHSR so closely spaced.

CaHSR drawing CB 1880 for the C1 alternative shows the rail system crossing the District's west branch of the Lakelands Canal at approximately station 2583+80. The canal capacities are as indicated above. The CaHSR will need to enclose the open portion of the west branch of the Lakelands Canal as indicated above to a location to the west of the CaHSR right of way. The District must maintain its ability to turn around on the west side of the CaHSR right of way so that canals may be tended and maintained. This is a safety matter as backing heavy equipment long distances is hazardous and invites accidents. Again this area will become congested with the state highway and CaHSR so closely spaced. Also, no water from the indicated retention basin shall be allowed to be discharged into the west branch of the Lakeland Canal.

CaHSR drawing CB 1861 for the C2 alternative shows the rail system crossing the District's west branch of the Lakelands Canal at approximately station 2577+00. This alternative appears to have less impact on the West Branch of the Lakelands Canal, but to the extent there are impacts the previous comments regarding delivery capacity.

L013-5

maintenance, access and employee safety while performing operation and maintenance apply.

L013-6

5. The CaHSR will cross over the District's Main Canal on the alignment of Nevada Avenue. The Main Canal is located on the south side of Nevada Avenue at CaHSR station 2594+50 shown on CaHSR drawing CB 1071, sheet 12 of 14 for the K2 alignment, near the south 1/4 corner of Section 33 T20S, R22E. The canal delivers water from the operating reservoir located at the intersection of 6th and Nevada Avenues to the west to approximately 1/4 mile west of State Highway 43 near the northwest corner of section 3, T21S, R22E. The capacity of the Main Canal along Nevada Avenue is 160 cfs. The District will require a minimum of two 60 inch diameter reinforced concrete pipes under the bed of the California High Speed Rail or an engineered reinforced concrete box culvert with a minimum of 40 square feet of cross sectional area to carry the flow. The replacement facilities must be sized with ample cross sectional area to avoid raising the water level upstream. The topography in this area is quite flat and higher water levels cannot be tolerated.

CaHSR drawing CB 1881 for the C1 alignment shows a crossing over the District's main canal east of Highway 43 on the south side of Nevada Avenue. As indicated, an engineered box culvert with adequate cross sectional area will be required so that no additional head (friction) loss is incurred. The topography in this area is quite flat and higher water levels cannot be tolerated.

6. The District's main canal, called the Sweet Canal, runs east of Highway 43 in a southeasterly direction. The Sweet Canal serves the majority of the land in the District. Its capacity is 250 cfs. That capacity is maintained to well south of the Tule River. The Sweet Canal is the District's major delivery canal. The canal continues to the southeast and parallels State Highway 43 beginning at the District's main (east/west) canal located near the NW corner of the NE quarter of Section 3, T21S, R22E and continuing to the southeast and crossing under State Highway 43 near 5th Avenue.

L013-7

Depending on the route chosen by the CaHSR Authority, the Sweet Canal will be crossed in an alignment that is at a very slight angle between the canal and the rail right of way. CaHSR drawing CB 1864 for the C2 Corcoran bypass alignment shows a crossing over the District's main canal east of Highway 43 at station 2738+00 to station 2747+00 with the track crossing the Sweet Canal at a flat angle. This is unworkable. The District will be cut off from tending its canal, performing maintenance and the length of the span over the canal is long. As indicated in comments submitted on the first DEIR in October 13, 2011, a canal crossing more perpendicular to the rail alignment and relocating of a portion of the canal on either side of the rail bed will be required. Unfortunately, there are many property owners in the area where the relocation is contemplated. Another alternative is an elevated crossing over the canal at the location shown on CaHSR drawing CB 1864, C2 Corcoran bypass alignment indicating a crossing over the District's main canal between approximately stations 2738+00 to station 2747+00. The majority of the acreage serviced by the District is served by the Sweet Canal. The CaHSR must accomplish whatever relocation is selected without interrupting the delivery of irrigation water to the growers in the District. The growers located in the southern portion of the District do not own or maintain irrigation wells. Those growers rely entirely on the District for their irrigation water. No outages of water service can be tolerated without causing crop loss and resulting financial loss to the growers.

Submission L013 (Carlo Wilcox, Corcoran Irrigation District, October 19, 2012) - Continued

L013-8

7. CaHSR drawing CT 1240 for the C2 alignment indicates an overpass and fill arrangement that impacts the southeastern portion of section 33 T20S, R22E and the western portion of section 34 T20S, R22E. The District is the Lessor in a long term (40 year) lease with a solar electric power generating company for the purpose of deriving income and producing clean green electricity utilizing the sun as the energy source. The footprint of the fill and roadway interchange will potentially reduce or cause the solar generation plant to be infeasible. Should the solar company be unable to efficiently generate power at this location, the State of California would lose a valuable source of clean green electric power that would have to be mitigated. The site is permitted and construction has already begun on a portion of the facilities. CID can lose in excess of \$8,000,000 over the next 40 years if the solar generation plant cannot be built as a result of interference from the CaHSR.

L013-9

8. The Bean Extension is a District Delivery canal located on the west side of the BNSF railroad right of way. The Bean Extension diverts water from the Main Canal that is located on the south side of Nevada Avenue parallel to Nevada Avenue. The Bean Extension carries the water in a southeasterly direction to approximately the southeast corner of the northeast quarter of section 10, T21S, R22E. The Bean Extension is fed by a 48 inch diameter turnout and carries 40 cfs. CaHSR drawing CB 1191 and CB 1192 shows a portion of the Bean Extension from station 2634+00 to 2702+00 to be relocated to the west. The canal will need to be realigned north of station 2634+00 back to tie in with the Bean Canal that feeds water into the Bean Extension.

L013-10

9. At the intersection of Orange Avenue and 5th Avenue, the District operates the AX Canal. The AX Canal carries water from the northeast along the alignment of State Highway 137. The AX Canal is located on the south side of State Highway 137 and runs parallel to the highway. The AX Canal has a capacity of 60 cfs. CaHSR drawing CB 1864, C2 Corcoran bypass alignment indicates a crossing over the AX canal at station 2763+00. The capacity of the AX canal at this location is 50 to 60 cfs. A 60 inch diameter reinforced concrete pipe crossing or an engineered reinforced concrete box with sufficient cross sectional area to carry the capacity of the ditch will be required to carry the capacity of the ditch without creating excessive head pressure. As indicated with respect to the other canal/rail crossings referenced, the canal crossing must extend at least 40 feet outside of the California High Speed Rail footprint so that our men and equipment can negotiate a "U" turn and travel up the opposite canal bank to operate the canal and perform operation and maintenance work safely.

L013-11

10. CaHSR drawing CB 1884 for the C1 alignment shows two crossings over the District's West Corcoran canal west of Highway 43 and east of Otis Avenue. The West Corcoran has a capacity of 20 cfs. A sufficiently large diameter reinforced concrete pipe crossing will be required to enable water to flow in the West Corcoran without backing the water unnecessarily. The District has little head pressure available for the West Corcoran as explained for other locations.

L013-12

11. The District's Lamberson (main) Canal as indicated on CaHSR drawing CB 1889 for alignment C1 shows the Lamberson Canal relocated to the east side of Santa Fe Avenue from station 2588+00 to 2916+00. The capacity of 250 cfs must be maintained. The crossing under Santa Fe Avenue to the south near station 2910+00 to 2916+00 needs to be constructed similarly to the existing Paris/Plymouth Avenue crossing so that additional head loss is not created. The structure will need to be tied into the road

L013-12

crossing to avoid additive entrance and exit losses, thereby increasing the upstream water levels to move water. This subject has been addressed previously in these comments.

L013-13

12. The District maintains a canal called the Hayes Lateral that carries water from the Sweet Canal to the west along the north side and parallel to Plymouth Avenue. The Hayes Lateral is designed to carry 60 cfs. The Hayes Lateral will be severed from the Lamberson Canal by locating the Lamberson Canal on the east side of Santa Fe Avenue as indicated on CaHSR Drawing CB 1890 for alignment C1. Relocating the Lamberson Canal to the east side of Santa Fe Avenue will cut the Hayes Lateral off from the Lamberson Canal, its water source. A sixty inch diameter reinforced concrete pipe will be required to reconnect the Hayes Lateral with the Lamberson Canal to carry the canal capacity under Santa Fe Avenue and the new rail alignment.

L013-14

13. The District owns and operates three irrigation water wells in the area along the east side of section 25, T21S, R22E. Well E-72 is located on the west side of the BNSF right of way where the Sweet Canal crosses under the BNSF right of way. Well E-70 is located on the west side of the Sweet Canal near Plymouth Avenue and well E-71 is located near the intersection of State Highway 43 and Plymouth Avenue. These wells are located on the reach of the Sweet Canal that is located on the west side of the BNSF right of way and parallel to the BNSF right of way. Depending on the route chosen, the wells may have to be replaced so that the water produced can be introduced into the relocated Sweet Canal.

L013-15

The District understands the task the California High Speed Rail Authority has been charged with to construct this huge infrastructure project as well as the aggressive time schedule in which it is to be completed. We offer the items above in an effort to sensitize the CaHSR to the various locations where the proposed rail and the District's irrigation facilities will interfere with one another, but also and most importantly, to make you aware of the complexity of doing the work in a manner that does not damage the economy of the growers in the District resulting from interruptions in irrigation water delivery. The CaHSR is not simply putting in some pipes, box culverts or bridges in order to construct the rail line. The District must continue to deliver irrigation water the entire time the project is being constructed. As indicated earlier in this text, all of the growers in the District and all of the growers in the southern portion of the District in particular neither own nor operate irrigation wells. The District has provided all of the irrigation water required for the operators to grow their crops throughout its 93 year history. The land owners in the District cannot tolerate any interruptions in irrigation water deliveries when the crops being irrigated need water without suffering economic devastation. The crop losses that would result on the crop acreage in the District if irrigation water service is disrupted would be in excess of \$100,000,000.

We can be contacted at (559) 992-5165 to discuss items included in these comments.

Sincerely,

  
Carlo J. Wilcox  
Manager

cc: Board of Directors

Submission L013 (Carlo Wilcox, Corcoran Irrigation District, October 19, 2012) - Continued



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## Response to Submission L013 (Carlo Wilcox, Corcoran Irrigation District, October 19, 2012)

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### **L013-1**

Refer to Standard Response FB-Response-AG-04, FB-Response-HWR-01.

As noted on page 3.6-61 in Section 3.6, Public Utilities and Energy, of the Revised DEIR/Supplemental DEIS, the Authority would work with irrigation districts and landowners to protect these irrigation systems. Canals may be bridged or placed in pipelines beneath the HST right-of-way. Irrigation pipelines crossing the alignment would be buried to an appropriate depth to sustain the weight of the HST and placed in protective casing so that future maintenance of the line could be accomplished from outside of the HST right-of-way.

### **L013-2**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments are being provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-3**

Refer to Standard Response FB-Response-HWR-01 and Master Response FB-Response-HWR-03.

HST design criteria include the goal of preserving existing floodplain functions. Existing channel capacity is evaluated, and features such as bridges and culverts are incorporated into the design to allow floodwater to pass through the HST alignment without increasing flooding by more than 1 foot above existing conditions during the 100-year event. The Authority has been coordinating with local districts, municipalities, and other agencies responsible for maintaining and operating flood control facilities.

### **L013-4**

Refer to Standard Response FB-Response-HWR-01.

### **L013-4**

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-5**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-6**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-7**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Footprint has been allocated for canal relocations in this area to provide for a perpendicular crossing. Design of specific canal-crossing features, including detailed canal relocation designs, will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran

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## Response to Submission L013 (Carlo Wilcox, Corcoran Irrigation District, October 19, 2012) - Continued

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### **L013-7**

Irrigation District.

### **L013-8**

Refer to Standard Response FB-Response-PU&E-03.

Page 3.6-61 in Section 3.6, Public Utilities and Energy, states that the Authority would work with utility owners during final engineering design and construction of the project to relocate utilities or protect them in place. As a "design-build" project, the project design would be completed by a contractor that would continue to coordinate with utility service providers during construction.

### **L013-9**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Footprint has been allocated for canal relocations in this area to provide for a perpendicular crossing. Design of specific canal-crossing features, including detailed canal relocation designs, will be carried out during later stages of design and will be coordinated through ongoing discussions with the Corcoran Irrigation District.

### **L013-10**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-11**

Refer to Standard Response FB-Response-HWR-01.

### **L013-11**

Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-12**

Refer to Standard Response FB-Response-HWR-01.

Design of specific canal-crossing features will be carried out during later stages of design and will be coordinated through ongoing discussions and design reviews with the Corcoran Irrigation District.

### **L013-13**

Refer to Standard Response FB-Response-HWR-01.

All canal crossings at proposed alignments have been provided with additional footprint to accommodate space for operation and maintenance vehicles to cross the canals. Footprint has been allocated for canal relocations in this area to provide for a perpendicular crossing. Design of specific canal-crossing features, including detailed canal relocation designs, will be carried out during later stages of design and will be coordinated through ongoing discussions with the Corcoran Irrigation District.

### **L013-14**

Refer to Standard Response FB-Response-PU&E-03, FB-Response-HWR-01.

### **L013-15**

Refer to Standard Response FB-Response-AG-04.

Submission L014 (Rich Merlo, Corcoran Unified School District, October 19, 2012)



**CALIFORNIA**  
High-Speed Rail Authority



**Comment Card**  
**Tarjeta de Comentarios**

**Fresno to Bakersfield High-Speed Train Section**  
Revised Draft Environmental Impact Report/  
Supplemental Draft Environmental Impact Statement  
(Revised Draft EIR/Supplemental Draft EIS)

**La Sección de Fresno a Bakersfield del Tren de Alta Velocidad**  
Proyecto Revisado de Informe de Impacto Ambiental/  
Declaración de Impacto Ambiental Proyecto Suplementario  
(Proyecto Revisado EIR/Proyecto Suplementario EIS)

Please submit your completed comment card at the  
end of the meeting, or mail to:

Por favor entregue su tarjeta completada al final de la  
reunión, o envíela por correo a la siguiente dirección:

**Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment, 770 L Street, Suite 800, Sacramento, CA 95814**

L014-1

The cc 201	Extended comment period for Fresno to Bakersfield High Speed Train Revised Draft EIR/Supplemental Draft EIS: July 20 – October 19	per 20, ally, or 2012.	El de re de	Extended el periodo de comentario público del Proyecto Revisado EIR/Proyecto Suplementario EIS Julio 20 – Octubre 19	al 20 anen que ser el o antes
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Name/Nombre: RICH MERLO  
Organization/Organización: Corcoran Unified School District  
Address/Domicilio: 1520 Patterson Corcoran, CA 93212  
Phone Number/Número de Teléfono: 559-991-8888  
City, State, Zip Code/Ciudad, Estado, Código Postal: Corcoran, CA 93212  
E-mail Address/Correo Electrónico: merlo@corcoranunified.com  
(Use additional pages if needed/Usar paginas adicionales si es necesario)

*Will there be mitigation for the sound that  
will affect John Muir Middle School &  
John C. Fremont Elementary School?*

*I would like the HSR to do everything possible that  
the sound resulting from the HSR be non-disturb  
from within our classrooms.*



**CALIFORNIA**  
High-Speed Rail Authority



U.S. Department  
of Transportation  
**Federal Railroad  
Administration**

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Response to Submission L014 (Rich Merlo, Corcoran Unified School District, October 19, 2012)

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**L014-1**

John Muir Middle School and John C. Fremont Elementary School will not be affected by the HST for either the BNSF or Corcoran Elevated alternatives. The two schools may benefit from the proposed 14-foot barrier for the two alternatives, which would provide extra acoustical mitigation from HST operations.

Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012)

PLANNING AND COMMUNITY  
DEVELOPMENT DEPARTMENT  
Lorelei H. Oviatt, AICP, Director  
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BAKERSFIELD, CA 93301-3223  
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DEVELOPMENT SERVICES AGENCY  
Planning and Community Development Department  
Engineering, Survey and Permit Services Department  
Roads Department



PLANNING AND COMMUNITY  
DEVELOPMENT DEPARTMENT  
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DEVELOPMENT SERVICES AGENCY  
Administrative Operations  
Engineering, Surveying and Permit Services  
Planning and Community Development  
Roads

FAXSIMILE TRANSMITTAL SHEET

FAX SERVICE FROM:  
KERN COUNTY PLANNING and COMMUNITY DEVELOPMENT DEPARTMENT

SENT BY: Craig Murphy, Division Chief  
Name of Sender

Date: 10/19/12

FAX NO. 916-322-0827

TO: California High Speed Rail Authority  
Company

ATTN: Fresno to Bakersfield Draft EIR comments

26 TOTAL PAGES (Including this cover sheet)

COMMENTS: Please confirm that you have  
received this fax to Allison 861-862-8605.  
We will send a hard copy through mail.

\\adm\jvb\planning\faxsh.t

October 19, 2012

FILE: High Speed Rail

California High Speed Rail Authority  
Attn: Mr. Mark McLoughlin  
770 L Street, Suite 800  
Sacramento, California 95814

Federal Railroad Administration  
Attn: Mr. David Valenstein  
1200 New Jersey Avenue, SE  
Washington, DC 20590

RE: Comments on California High-Speed Train: Fresno to Bakersfield Section Revised Draft  
Environmental Impact Report/Supplemental Draft Environmental Impact Statement and Draft Section  
4 (F) Statement (July 2012).

Dear Mr. McLoughlin and Mr. Valenstein,

L015-1

The Kern County Planning and Community Development Department appreciates the opportunity to provide supplemental comments on the Revised Draft EIR/Supplemental EIS for the Fresno to Bakersfield Section of the High Speed Train. The system includes major components in Kern County including the Bakersfield Station, potential locations for a Heavy Maintenance Facilities and the railway alignments. The purpose of CEQA and NEPA is to provide an opportunity for the general public as well as other agencies with specific expertise to review the described project and analysis and provide comments and suggestions for mitigation and the avoidance or reduction of impacts. The courts have directed and the CEQA guidelines have reflected six separate policy grounds that justify the requirement that lead agencies must seek and respond to public comments: sharing expertise, disclosing agency analysis, checking for accuracy, detecting omissions, discovering public concerns and soliciting counter proposals (CEQA Guidelines 15200). The Authority and Federal Railroad Administration as lead agency, has chosen to present two sections of the project in two separate but related documents with formats that are not consistent. These two sections of the system involved impacts and interests to over 2.2 million Central Valley residents and deserve a robust and careful public review process to ensure compliance with the purpose of CEQA and NEPA, not merely the legal requirements. In addition these documents are presented as project level rather than program level documents which require a greater level of assessment and review.

Public Notice and Review

L015-2

The Revised EIR/Supplemental EIS is presented as a project level document for the entire 114 miles of alignments and related infrastructure. Unlike other development projects, this project has not been initiated by a specific property owner and, therefore, affected property owners have no information or expectation that they would be included in the project description and that their property might be used for a track alignment or be adjacent to the alignment. Under CEQA, all members of the public hold a "privileged position" in the CEQA process and certainly property owners who may lose businesses or be relocated have an even higher fundamental right to know if and how the project will impact them, what are the impacts on the surrounding environment and how can they participate in the formulation of feasible alternatives and appropriate mitigation. "[A] paramount consideration is the right of the public to be informed in such a way that it can intelligently weigh the environmental consequences of any contemplated action and have an appropriate voice in the

Page 1 of 5

# Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

L015-2 formulation of any decision" (Environment Planning and Information Council v. County of El Dorado (3d Dist. 1982) 131 Cal App.3d). The foundation of the CEQA/NEPA process is an accurate project description that provides for meaningful public participation. Our previous comment in October 2011 requested more detailed annotated maps to enable property owners to understand the potential impacts at a project level. We appreciate the effort to further inform the public on the site specific alignments being considered for implementation.

## Air Quality and Global Climate Change

L015-3 This Revised DEIR/Supplemental EIS continues to be inadequate as a project level and informational document. As noted in our previous comment, the referenced source of the Air Quality section, including location, is not included in the CD ROM or documents provided to the County or the public. Instead it is referenced as Appendix G of the Fresno to Bakersfield Section Air County Technical Report as before. If therefore, can be assumed this document was again not circulated in the documents sent out for public comment. While a few sentences were added to the air quality section to explain methodology, Chapter 3.3 contains no specific quantification of amounts for construction emissions (Table 3.3-21) and no presented analysis at all for operational emissions. Instead the chapter includes simplified "yes or no" statements as to if the construction emissions will exceed the adopted thresholds. Such a presentation assumes that the public has no need to verify the methodology and calculations used for the air modeling and that the magnitude of the exceedance is relevant to informed decision-making.

This chapter needs to include actual amounts in tons per year of the construction emissions and operational emissions, including the indirect air quality impacts of the employees driving to the trains as operators and the ridership. Finally, the omission of the technical source document on air quality from the circulation of the Revised DEIR/Supplemental EIS deprives the public of fundamental information necessary for a complete evaluation of the accuracy of the information presented and meaningful comments. This and all source documents of technical matter should be circulated along with a clear location for any programmatic documents that are being referenced in the Revised DEIR/Supplemental EIS. A search of the Internet does show that this Air Quality report is posted on the website under the listing of the Revised DEIR/Supplemental EIS but is not included as an appendix of the report. It contains a 734 page modeling run labeled "construction emissions" within the raw summaries of the results. This posting of raw data fails in the fundamental purpose of CEQA and NEPA, to inform the public. Further there is no evidence this was circulated to the public who requested a copy of the Revised DEIR/Supplemental EIS. Certainly the Kern County Planning and Community Development Department public copy and copy at Beale Library contained no Appendix G - of the Fresno to Bakersfield Section Air County Technical Report in either the first or second circulation of the documents.

The intention of the Revised DEIR/Supplemental EIS is to provide analysis and informed summaries of data so that the average citizens and decision maker can understand the size and scope of the impacts. Absent the actual circulation of the technical study, informative charts and tables summarizing the modeled construction and operational emissions should be provided. Instead the document includes a detailed Greenhouse Gas emissions table and regional wide vehicles miles traveled chart that showcases a reduction from the replacement of cars with the HSR use. Such a presentation while a useful marketing tool, does not meet the fundamental requirements of showing the public, in Chapter 3.3 of the Revised DEIR/Supplemental EIS, the facts on air impacts for PM 10, NOx and VOC production. Instead the public must possess sufficient technical expertise to be able to search for the technical report and raw data presented. The document is fundamental flawed as an informational document and requires recirculation.

## Roads Department Comments

The Kern County Roads Department has reviewed the DEIR/SDEIS and provides the following comments for the record and for your response.

L015-4 Comment 1: Page S-12, Between 2010 and 2035, VMT is projected to increase by 16% in Fresno County and 67% in Kern County; during this time period, VMT is expected to decrease by 5% in

L015-4 Tulare County and 23% in Kings County. SB 375 requires each County to decrease VMT. This statement is in contrast to those efforts.

L015-5 Comment 2: Page S-17, Transportation: The Circulation Element of Kern County General Plan has a threshold requiring all County roadways to be mitigated to a LOS of D or better. However, the Kern County Metropolitan Bakersfield General Plan as well as the City of Bakersfield General Plan require mitigation to LOS C.

L015-6 Comment 3: Page 2-35, The four counties of Fresno, Kings, Tulare, and Kern are projected to continue to grow at an average of 2.9% per year. The Kern Council of Government (KernCOG) uses the historical growth rate of 2% in the Metro Bakersfield area, and a 1.5% in the remainder of Kern County for modeling purposes.

L015-7 Comment 4: Page 2-37, A typical density for an area similar to the San Joaquin Valley was taken from the Colorado Department of Transportation 2006. This becomes the basis for comparing the HST project alternatives. Under this scenario, what are the similarities between the San Joaquin Valley and the Colorado Department of Transportation? Please explain.

L015-8 Comment 5: Page 2-39, The vehicle miles traveled (VMT) from 2009 to 2035 is projected to increase by 67% in the four-county region. The region is projected to increase from approximately 48 million to almost 80 million in 2035 (Cambridge Systematics, Inc. 2012). However, on page S-12, first paragraph, the four-county region is projected to increase from almost 62 million to 80 million miles traveled per day in 2035. Why is there a discrepancy between 48 million and 62 million? Also, the 67% increase was shown on page S-12 as being in Kern County, not the four-county region.

L015-9 Comment 6: The Study refers to several Studies performed by Cambridge Systematic, Inc. Were these included in this EIR? Please verify.

L015-10 Comment 7: Page 2-101, Research suggests that the percentage of transit passengers arriving/departing transit stations by car and needing to park decreases as land use development and population around the stations increases. Please provide the Research references to explain this theory.

L015-11 Comment 8: Page 2-107, Vision California utilizing two models (UrbanFootprint & Rapid Fire) have been deployed. Do these models use the existing Kern County and City of Bakersfield general Plan land Use designations?

L015-12 Comment 9: Page 3.2-9, Please see comment #2 above. The County minimum threshold within Metropolitan Bakersfield is a LOS C.

L015-13 Comment 10: Page 3.2-46, Table 3.2-10, Intersection ID #41 states "1st St" when it should be 21<sup>st</sup> St.

L015-14 Comment 11: Page 3.2-48, Table 3.2-11 lists the Proposed Bakersfield Bus Routes for GET. Recently, GET changed bus routes and schedules.

L015-15 Comment 12: Page 3.2-60, Please previous comment #2 above. The County minimum threshold within Metropolitan Bakersfield is LOS C. Figure 3.2-26 & 3.2-27 show a LOS D as being satisfactory. Please verify.

L015-16 Comment 13: Page 3.2-72, Table 3.2-13 is improperly referenced in the paragraph above. "This information is provided in Table 3.2-12." Please verify.

L015-17 Comment 14: Page 3.2-116, Table 3.2-35, Intersection #23 the Project is increasing the delay by 8 seconds in the AM. This should be considered an impact.

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- L015-18 | Comment 15: Page 3.2-141, Table 3.2-50, The mitigation for intersections 1 & 15 show mitigation of restriping the intersections to provide additional lanes. Additional lanes will require more than restriping.
- L015-19 | Comment 16: Pages 3.2-142 & 143, Table 3.2-51, Mitigation of intersections along Golden State Avenue will require more than additional lanes. The reason for delay along Golden State Avenue is that vehicles queue in one lane because there is only one lane for eastbound traffic on Golden State Avenue to eastbound SR 178. Major improvements will be needed at this interchange to alleviate this delay.
- L015-20 | Comment 17: The Greater Bakersfield Separation of Grade District has submitted comments related to the proposed grade separations at the West beltway, Kratzmeyer Road (Olive Drive) and Renfro Road and the reconstruction of the grade separation at Seventh Standard Road. This Department supports these comments.
- L015-21 | Comment 18: Design speeds for overpasses and underpasses that allow for straight through traffic should be 60 mph. Reduced design speeds may be used for overpasses with terminating roadways and for connector roads.
- L015-22 | Comment 19: The underpass proposed for Kimberlina Road should be wide enough to accommodate 6 lanes since it is designated as an arterial roadway and provides access between SR 99 and SR 43.
- L015-23 | Comment 20: Grade separations should be designed to accommodate bicycles as well as pedestrians.

## Safety and Security

The Kern County Fire Department has reviewed the DEIR/SDEIS and have provided their comments on separate letterhead. These comments are attached to this letter for the record and require individual responses under CEQA.

## Technical Studies not Circulated

- L015-24 | As the CD-ROM provided to the public is capable of holding many thousands of pages of information it is unclear why these as well as other technical appendices found on the website but not on the CD-ROM were not circulated. They include but are not limited to the following 28 technical reports: Aesthetics and Visual Resources Technical Report, Air Quality Technical Report, Air Quality Technical Report Appendices A-G-1, Biological Assessment (REDACTED), Biological Resources and Wetland Technical Report (REDACTED), Community Impact Assessment, Community Impact Assessment Appendices A-D, Draft Relocation Impact Technical Report, Geology, Soils and Seismicity Technical Report, Hazardous Wastes and Materials Technical Report, Hazardous Wastes and Materials Technical Report Appendices A-B, Hazardous Wastes and Materials Technical Report Appendix C 1 of 2, Hazardous Wastes and Materials Technical Report Appendix C 2 of 2, Hazardous Wastes and Materials Technical Report Appendix D 1 of 2, Hazardous Wastes and Materials Technical Report Appendix D 2 of 2, Hydrology and Water Resources Technical Report, Noise and Vibration Technical Report, Ridership and Revenue Model, Transportation Technical Report, Transportation Technical Report Appendix A, Transportation Technical Report Appendix B-C, Transportation Technical Report Appendix D, Transportation Technical Report Appendix E, Transportation Technical Report Appendix F, Transportation Technical Report Appendix G-1, Transportation Technical Report Figures Part 1 of 2, Transportation Technical Report Figures Part 2 of 2, Wetlands Delineation Report (REDACTED). There is no explanation on the website for the use of the term REDACTED in capital letters next to three of the reports. These reports are referenced in various places in the Revised DEIR/Supplemental EIS as containing the facts to support the analysis but are were not circulated for public comment, are not readily available for public review and are not specifically referenced in Chapter 10.0 References/Sources Used in Document Preparation. It is clear they were used in preparation of the document, however, they were not provided to the public as part of the recirculated Revised DEIR/Supplemental EIS and therefore the document is fundamentally flawed as an informational document and requires additional analysis and recirculation.

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## Request for Recirculation

L015-25

The California Supreme Court in the Laurel Heights II CEQA case formulated the legal test for determining when recirculation is required. One of the circumstances identified is when the draft EIR is so fundamentally inadequate and conclusory in nature that public comment on the draft was in effect meaningless. (Mountain Lion Coalition v California Fish and Game (1989) 214 Cal. App. 3d 1043). That cited case went on to say "Rather than squarely addressing the subjects that were set out in the court's order and submitting their environmental conclusions to public scrutiny, appellants chose to circulate a document that simply swept the serious criticisms of this project under the rug" (Mountain Lion Coalition v California Fish and Game Com. (1989) 214 Cal. App. 3d 1043). This and other court decisions stand for the principle that the Draft EIR is not simply an accumulation of paperwork or exercise to be accomplished but includes meaningful analysis and is to be presented in a manner that provides the public a useable roadmap for understanding the project, the impacts and the proposed mitigation measures. This standard is imposed on local government by the State Attorney General in implementing CEQA and applies to all land use decisions local governments process and propose for approval. From grocery stores to new residential subdivisions, from renewable energy projects to landfills, local government EIRs are held to high standards of disclosure by the State officials and the courts. Kern County EIR documents are circulated with the technical studies and relevant reports readily available for the public to review. The State should provide no less in their own CEQA/NEPA process. The Revised Draft EIR/Supplemental EIS fails to provide substantive analysis and information in a format that the public can access and understand on the important issue of the impacts from construction and operations on air quality in the San Joaquin Valley. The agency failed to circulate 28 technical studies, including the air quality report, with substantial quantitative information which was not shown anywhere in the Revised Draft EIR/Supplemental EIS for the public to review. This omission deprived the public of information necessary for meaningful comments and had the effect of obscuring and concealing the true impacts of project construction and operation. These fundamental deficiencies need to be corrected and another revised document, which includes all the technical reports and studies, circulated for a new public review period.

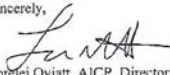
## Citizen Comments

L015-26

Attached are comments from citizens on the proposed High Speed Train that have been submitted to the Kern County Board of Supervisors and the Planning and Community Development Department. These are submitted for the record and require individual responses under CEQA.

Thank you for the opportunity to provide comment.

Sincerely,

  
Lorelei Oviatt, AICP, Director  
Kern County Planning & Community  
Development Department

cc: Kern County Board of Supervisors  
CAO  
County Counsel  
County Departments: Roads, Engineering, Surveying, & Permit Services, Fire  
Grand Jury  
City of Bakersfield  
Kern Council of Government

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Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development  
Department, October 19, 2012) - Continued

**COMMENTS FROM  
KERN COUNTY FIRE DEPARTMENT**

**Brian S. Marshall**  
**Fire Chief & Director of Emergency Services**

Fire Department Headquarters  
3642 Victor Street • Bakersfield, CA 93308 • www.kerncountyfire.org  
Telephone 6 1-391-7000 • FAX 661-399-2915 • TTY Relay 800-735-2929



October 16, 2012

Lorelei Oviatt, Kern County Planning and Community Development Director  
Kern County Public Services Building  
2700 "M" Street, Suite 100  
Bakersfield, California, 93301-2370

**RE: California High Speed Train**

Lorelei,

The Kern County Fire Department (Fire Department) has performed an exhaustive review of the proposed California High Speed Train (HST) that is to be constructed from the Bay area to Southern California. The Revised Draft Environmental Impact Report for the Fresno to Bakersfield segment has been released for review and comment. The Department believes this project will have several significant impacts on the day-to-day operations of the Fire Department. This letter documents the significant impacts on the Fire Department and mitigation requirements to reduce the stated impacts to an acceptable level.

**OVERVIEW**

As the HST enters Kern County, the Fire Department will be providing fire, rescue, and emergency services from several fire stations located along the proposed routes. These fire stations directly impacted include those located in Delano (Fire Station 34 and 37), McFarland (Fire Station 33), Wasco (Fire Station 31), and Shafter (Fire Station 32), Greenacres (Fire Station 65), Norris (Fire Station 61), and Landoc (Fire Station 66). Specialized firefighting and rescue resources necessary to respond to a catastrophic emergency are located throughout Metropolitan Bakersfield.

**IMPACTS TO THE KERN COUNTY FIRE DEPARTMENT**

The HST presents significant challenges to the Fire Department due to the following factors:

- Construction Impacts
  - A large number of employees, heavy equipment, elevated construction sites and detours around construction sites will increase demands on the Fire Department by increasing emergency activity; requires specialized equipment in the event of an emergency; and, increases Fire Department response time to day-to-day emergencies due to detours.
- Elevated Railways
  - Elevated railways will significantly impact the Fire Department's ability to access accident sites thus hindering the rescue of trapped and injured passengers.
- Large, heavy trains carrying hundreds of passengers
  - The High Speed Trains presents a significant impact on the Fire Department's ability to rescue passengers and crew during an accident or derailment and then provide numerous injured passengers and crew with emergency medical care.
- Heavy Maintenance Facility (HMF)
  - A HMF presents significant impacts on the Fire Department's ability to provide emergency services to maintenance workers in the event the employees have a medical emergency or become entrapped during repair or maintenance operations.

Proudly Serving the cities of Arvin, Bakersfield, Delano, Maricopa, McFarland, Ridgecrest, Shafter, Taft, Tehachapi, Wasco, and all Unincorporated Areas of Kern County

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Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

L015-27

- Tunneling
  - 1) If tunnels are required along the proposed route, the Fire Department will have significant impacts during fire or rescue operations due to the inability to operate for long durations in an environment that would be Immediately Dangerous to Life and Health (IDLH).
- Training
  - 1) The Fire Department has NO experience or training with high speed trains and how to perform firefighting or rescue operations if there was a catastrophic accident.

L015-28

**MITIGATION REQUIREMENTS**

It is the professional opinion of the Department that the HST will have a negative effect on the Department's ability to continue to provide a high level of emergency services, not only to this project, but also to the surrounding property owners. Furthermore, the mitigation measures provided to the Department by HST are not adequate to mitigate the risk of an uncontrolled fire, rescue, or medical emergency response. In the expert experience of the Department, the appropriate mitigation is the purchase of one aerial ladder truck capable of firefighting or rescue operations on elevated railways; a fire rescue truck capable of lifting heavy loads in order to extricate trapped passengers or crew members; a mass casualty response vehicle capable of treating hundreds of injured passengers or crew members; specialized equipment to fight fires and rescue passengers or crew members; 24 high-capacity, long-duration breathing apparatus; and, training to ALL members of the Fire Department in the operation of the HST and emergency response requirements during a catastrophic accident.

Therefore, in order to mitigate the significant impact that this project creates, HST is required to purchase and deliver to the following:

- 100 Foot Aerial Ladder Truck
  - 1) A 100-foot aerial ladder truck, manufactured to the Fire Department's specifications with no substitutions.
  - 2) The 100-foot aerial ladder truck must be purchased, constructed, and delivered (construction and delivery time is estimated to be nine months) to the Fire Department 30 days prior to the start-up of the project. Additional time may be required in order to place the 100-foot aerial ladder truck in service and to allow for training personnel assigned to operate the vehicle.
  - 3) The 100-foot aerial ladder truck shall be fully equipped to Department specifications.
  - 4) The final authority on the specifications for the 100-foot aerial ladder truck shall rest with the Fire Department.
  - 5) The vehicle title for the 100-foot aerial ladder truck shall be transferred to the County upon delivery.
- Fire Rescue Truck
  - 1) A fire rescue truck with a 50-ton rotator crane, manufactured to the Fire Department's specifications with no substitutions.
  - 2) The fire rescue truck must be purchased, constructed, and delivered (construction and delivery time is estimated to be nine months) to the Fire Department 30 days prior to the start-up of the project. Additional time may be required in order to place the fire rescue truck in service and to allow for training personnel assigned to operate the vehicle.
  - 3) The fire rescue truck shall be fully equipped to Department specifications.
  - 4) The final authority on the specifications for the fire rescue truck shall rest with the Fire Department.
  - 5) The vehicle title for the fire rescue truck shall be transferred to the County upon delivery.
- Mass Casualty Response Vehicle
  - 1) A Mass Casualty Response Vehicle, manufactured to the Fire Department's specifications with no substitutions.
  - 2) The Mass Casualty Response Vehicle must be purchased, constructed, and delivered (construction and delivery time is estimated to be nine months) to the Fire Department 30

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L015-28

days prior to the start-up of the project. Additional time may be required in order to place the Mass Casualty Response Vehicle in service and to allow for training personnel assigned to operate the vehicle.

- 3) The Mass Casualty Response Vehicle shall be fully equipped to Fire Department specifications.
  - 4) The final authority on the specifications for the Mass Casualty Response Vehicle shall rest with the Fire Department.
  - 5) The vehicle title for the Mass Casualty Response Vehicle shall be transferred to the County upon delivery.
- Specialized Firefighting and Rescue Equipment
    - 1) The HST shall purchase specialized firefighting and rescue equipment necessary for the Fire Department to have the capability to respond to a catastrophic incident.
    - 2) The specialized equipment required shall meet the minimum equipment list as mandated by a Type 1 Urban Search and Rescue vehicle.
  - High-Capacity Long Duration Self Contained Breathing Apparatus
    - 1) The HST shall purchase 24 High-Capacity, Long Duration Breathing Apparatus.
    - 2) All accessories necessary for Fire Department personnel to use the High-Capacity, Long-Duration Breathing Apparatus shall be included in the purchase.
  - Training
    - 1) The HST shall provide the Fire Department with training related to the operation of the HST and the procedures for responding to an incident involving the HST.
    - 2) The training shall be at the Fire Department's Training Center and scheduled to accommodate the Fire Department's personnel who may respond to an emergency involving the HST.

L015-29

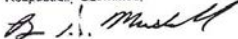
Additionally, due to the scope and complexity of the project, the HST shall provide a Fire Protection Specialist to the Fire Department during the plan review process. The HST will be allowed to select the Specialist from a list of qualified specialists provided by the Fire Department. Furthermore, the HST shall develop a comprehensive Fire and Life Safety plan that describes the methods to reduce the potential of an uncontrolled fire or mass casualty incident, thus reducing the threat to life and property. These plans must be submitted and approved by the Fire Department prior to permit approval.

The Fire Department has determined that the risk of the HST is a significant environmental impact, a threat to the public and firefighters, and is a challenge to firefighters who may be called on to respond to an emergency and must be mitigated. This letter outlines the minimum mitigation requested by the Fire Department.

The Fire Department looks forward to working with the management and sub-contractors of HST during the construction phase of the project. In addition, the Fire Department recognizes the need for HST and the Fire Department to have a good working relationship during the day-to-day activities and during any future expansion projects that may occur.

If additional information is required, please contact Fire Chief Brian Marshall by phone at (661) 391-7011, by fax at (661) 391-7013, or send an e-mail to [bmarshall@co.kern.ca.us](mailto:bmarshall@co.kern.ca.us).

Respectfully Submitted,



BRIAN S. MARSHALL  
Fire Chief & Director of Emergency Services

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Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development  
Department, October 19, 2012) - Continued



**COMMITTEE FOUNDERS:**  
Jeff Taylor, Chairman  
William Descary  
Michael Kennedy  
Dr. Anil Mehta  
Dr. Girish Patel

October 5, 2012

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Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment  
770 L Street, Suite 800  
Sacramento, CA 95814

SUBJECT: SAVE BAKERSFIELD COMMITTEE REVISED DRAFT EIR/SUPPLEMENTAL  
DRAFT EIS COMMENT.

INTRODUCTION

Save Bakersfield Committee is a grassroots group of citizens opposed to the high-speed rail project as currently proposed. Many of the issues raised in this comment were addressed by Bakersfield City officials, Kern County officials and members of the public in comments submitted to the Authority for the previous 2011 EIR/S documents, but have not been adequately responded to or addressed in the 2012 Revised Draft EIR/S documents. Save Bakersfield Committee requests that the High Speed Rail Authority adequately respond to issues, comments and questions contained in this document.

VIOLATIONS OF NEPA AND ENVIRONMENTAL JUSTICE

L015-30

Non-compliance with National Environmental Policy Act (NEPA) provisions including widespread denial of public and local authority participation in the NEPA process by the California High Speed Rail Authority (Authority) is so egregious that the Federal Railroad Administration (FRA) must consider all scoping and planning of the project thus far completed by the Authority invalid. Authority violations of NEPA are sufficiently severe to necessitate planning for the project to start anew in strict compliance with all NEPA laws and regulations including those of Environmental Justice (EJ) that provide for effective efforts to notify the affected public to promote sufficient public participation in the scoping and planning process as per the intent of NEPA. The severity of Authority NEPA violations necessitates that the FRA withhold approval of federal funding for the California High-Speed Rail project until all prior NEPA violations have been reversed, remedied and mitigated.

L015-31

The FRA is the lead federal agency responsible for project oversight and compliance with NEPA, the Endangered Species Act, and the National Historic Preservation Act. The US Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), the FRA, and the California High Speed Rail Authority (CHSRA) signed a Memorandum of Understanding (MOU) in 2010, creating an integrated process for compliance with NEPA. The MOU includes a series of checkpoints to determine the least environmentally damaging practicable alternative (LEDPA) for the High Speed Rail project for the purpose of creating an integrated NEPA document that would meet the needs of the FRA and the USACE. Draft Environmental Impact Report (DEIR) documents have been prepared for the High Speed Rail project by the FRA and the Authority with USACE being a cooperating agency.

CITIZEN COMMENTS

Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

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L015-31

Section 6.1 "Preferred Alternative" of the Revised Draft Fresno to Bakersfield EIR/S (RDEIR) states that the selection of a preferred alternative will take into account the physical and operational characteristics, and potential environmental consequences associated with the HST alignments and station and heavy maintenance facility alternatives in which relative differences are identified, such as physical and operational characteristics that include travel time, capital cost, the ability to test and certify trains operating at speeds of 220 mph, right-of-way availability and ability to reach agreement with stakeholders to acquire easements or operating rights, construction complexity, impacts on existing railroad facilities and operations and available funding limitations (e.g., American Recovery and Reinvestment Act of 2009 (ARRA) deadlines).

According to the MOU between CHSRA, FRA, EPA and USACE Tier 2 project level reviews are not limited to Tier 1 program level alternatives. The MOU clearly states that "As sections of the proposed High Speed Train (HST) system are advanced, these Tier 2 reviews will examine a range of HST project alternatives within corridors and at station locations selected in the Tier 1 EIR/EIS in addition to other corridors or alternatives that may be identified through public scoping, or through the availability of new information or analysis not considered during the Tier 1 phase, as well as a no action alternative."

The MOU states that a preferred alternative will take into account potential environmental impacts including transportation related topics (air quality, noise and vibration, and energy), human environment (land use and community impacts, farmlands and agriculture, aesthetics and visual resources, socio-economics, utilities and public services, and hazardous materials and waste), cultural resources (archaeological resources, historic properties) and paleontological resources, natural environment (geology and seismic hazards, hydrology and water resources, and biological resources and wetlands) and section 4(f) and 6(f) resources (certain types of publicly owned parklands, recreation areas, and historic sites).

The MOU at Checkpoint B, (Identification of Project Alternatives for Analysis in the DEIS) clearly states that the public interest review process may require alternatives to be revisited if necessary. A July 22, 2005 letter from the EPA and USACE is incorporated in the MOU as Appendix C. The letter concurred with the alternative most likely to contain the LEDPA for the statewide California HST Project.

The decisions were commensurate with the level and breadth of the environmental data made available to the USACE and EPA at that time and was focused on Section 404 and NEPA issues that were ripe for consideration. However, the prior Tier 1 concurrences do not obviate the need for FRA and the Authority to fully comply with all requirements of the Clean Water Act section 404(b) (1) Guidelines (40 C.F.R. Part 330) during the preparation of subsequent Tier 2 (project-level) EISs, nor do they fulfill the USAF EIS's public interest review process and determination pursuant to 33 C.F.R. Part 320.4(a). New information or changes in project decisions should be carefully considered when developing alternatives and may require Tier 1 alternatives to be revisited, if necessary.

L015-32

NEPA requires that the Authority demonstrate a need for the proposed project compared with a no build option. Arguably, the need threshold for a high speed rail system has not been met. NEPA also mandates that the Authority provide reasonable alternative studies for the project's proposed action for the purpose of identifying and evaluating the associated environmental impacts of the alternatives to

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L015-32

determine which alternative will accomplish the purpose of the project while causing the least amount of impacts to the environment.

L015-33

Environmental impacts associated with a more direct north-south route along the Central Valley's I-5 corridor to the southern portion of the San Joaquin Valley could be much less widespread and severe than the Fresno to Bakersfield alignment being considered in the current RDEIR because the I-5 route could use state-owned right of way or utility easements, reducing conflicts with property owners. In 2010, French National Railway officials proposed running the bullet train along I-5 through the Central Valley linking the system to San Francisco. The French National Railway officials are experienced and successful bullet train operators. They determined that the I-5 route would be the shortest, fastest and lowest-cost alignment, with a price tag of about \$38 billion which is substantially less than CHSRA's current route with an estimated cost of \$68.4 billion.

The I-5 rail alignment has never been studied under NEPA provisions because it was eliminated prior to the start of the formal review process. The I-5 alignment is arguably a "better" preferred alternative and merits scoping, planning and environmental study under NEPA. The I-5 alignment may not perform as well for connecting Central Valley cities such as Fresno and Bakersfield, but that could be mitigated by adding spur lines along existing transportation corridors. It is possible that this alternative could outperform the current alternatives for nearly all desired characteristics as described in the RDEIR.

The current RDEIR states that local agencies endorsed the downtown Bakersfield, Truxtun Avenue station. However, concepts considered desirable prior to full evaluation of environmental effects should not preclude consideration of NEPA and CEQA alternatives within an RDEIR that might be effective in avoiding or reducing significant environmental effects. Previous local agency endorsements are outdated. More recently, the City of Bakersfield, City of Wasco and Kern County approved resolutions of opposition to the project as planned. This should be considered "new" information under the 2010 MOU, and under NEPA guidelines.

There are no true rail alternative alignment studies for the Bakersfield area in the current RDEIR documents. The RDEIR examined only minor variations or combinations of the B1 and B2 alternative alignments when they developed the B3 hybrid alignment in Bakersfield. The three Bakersfield alternative alignments will cause similar, devastating impacts to the Bakersfield community. All three alignments are in most cases only feet apart from each other as they cut through the heart of metropolitan Bakersfield. All three of the alternative alignments are elevated as high as 90' for the entire 12 mile long route through metropolitan Bakersfield and will cause widespread and excessive impacts to all members of the community who live and work within sight and sound of the elevated train tracks.

City of Bakersfield officials made a formal request to the CHSRA that a peripheral alignment be studied. Bakersfield City officials also addressed other serious issues that require response by the CHSRA in the 2011 Environmental Impact Comment to the CHSRA. However, the request for a peripheral alignment and virtually every other issue brought to the attention of the CHSRA by the City of Bakersfield has been completely ignored.

A RDEIR of less destructive and impactful alternative station locations and alignments outside of, but in close proximity to, metropolitan Bakersfield have not been considered. Peripheral alignment

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Department, October 19, 2012) - Continued

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L015-33 alternatives would cause far fewer negative impacts, especially if built at grade and may cost hundreds of millions of dollars less than the current alternatives. A peripheral alignment alternative may greatly reduce property acquisition costs and the exorbitant expense of constructing an elevated downtown Bakersfield station and 12 miles of elevated viaducts that cut through the heart of Bakersfield.

All three of the Bakersfield alternative alignments will unnecessarily cause "south of the tracks" devaluation to a extended number of properties located within sight and sound of the 12 mile long elevated train tracks and will cause huge impacts to our local property tax base. All three alignments will unnecessarily destroy an unacceptable number of homes, businesses, churches, jobs and community infrastructure. Widespread and severe destruction of a major portion of a city with severe impacts to culture and quality of life caused by that destruction violate NEPA and CEQA law and violate the intended provisions of EJ.

L015-34 The RDEIR does not consider other alternatives that could avoid or substantially reduce the project's significant impacts, such as an alignment that follows established transportation corridors. Failure of the RDEIR documents to consider a reasonable range of alternatives makes the analysis inadequate and incomplete and violates the intended provisions of EJ.

L015-35 The Council on Environmental Quality (CEQ) has direct oversight of the federal government's compliance with Executive Order 12898 and NEPA regulations. The CEQ and the EPA have developed guidance policies to further assist the FRA with their NEPA mandated procedures so that EJ concerns are effectively identified and addressed.

The FRA is the lead federal agency for the California High Speed Rail project under NEPA and is responsible for formulating, implementing and reviewing environmental policies of the project to insure compliance with procedural requirements of NEPA. The FRA is also responsible for technical and legal review of regional Environmental Impact Statements. The FRA is chartered to begin its process of considering the environmental impacts of a proposed action by consulting with appropriate federal, state, and local authorities, and with the public at the earliest practical time in the project planning process. The FRA's charter also includes complying with all applicable environmental review laws and regulations of NEPA. The FRA process includes encouraging broad public participation during scoping and review of draft environmental documents. In addition to publication of notices in the Federal Register, the FRA is responsible for making effective efforts to notify the affected public.

On August 2, 2012 the Authority for the first time adopted an Environmental Justice Guidance (EJG) policy, even though the Authority has been planning the project for well over ten years. Recently, the CHSRA was requested to provide their Right of Way Agents Manual which is an integral part of their EJG policy, but CHSRA responded that they are using Caltrans' manual. This is further evidence that the policy was an afterthought and is convincing evidence that the Authority did not consider or comply with provisions of EJ that are mandated by NEPA laws and regulations from the Authority's inception through the entire design and planning stages of the project to the present day.

Title VI of the Civil Rights Act of 1964 is a non-discrimination statute providing that: No person in the United States shall, on the ground of race, color, national origin, sex, age, or disability, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. EJ is a component of Title VI and is a part of environmental law and regulations of NEPA. In September 2011, the FRA requested that the

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L015-35 Authority adopted Title VI policy. The Authority did not adopt Title VI policy until its March 2012 Board meeting.

NEPA regulations also include Executive Order 12898. The Order addresses achieving EJ by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The order specifically emphasizes the importance of NEPA's public participation process, directing that "each federal agency shall provide opportunities for community input in the NEPA process." The FRA in accordance with NEPA regulations is responsible for insuring effective policies to help "identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents, and notices."

Authority compliance with EJ regulations mandated by NEPA were not even considered until September 15, 2011, when the FRA directed the Authority to develop and implement a Title VI Program to finally address how the Authority will ensure nondiscrimination in the federally financially assisted high-speed rail project. As of August 2, 2012 the Authority had not yet filled the position of Title VI Coordinator.

L015-36 During the August 2, 2012 Authority Board meeting held in Sacramento, the Authority for the first time adopted an EJG policy. Board meeting Agenda Item #4 made two requests of the Board. (1) Approve the California High-Speed Rail Authority Environmental Justice Policy and authorize the Chief Executive Officer, Jeff Morales, to sign and widely disseminate. (2) Adopt the Environmental Justice Guidance and authorize the CEO to transmit the EJG policy to the Federal Railroad Administration. The Authority also adopted Resolution #HSRA 12-22 that resolved to approve the new EJG policy.

The EJG policy adopted by the Authority on August 2, 2012 states that "The Authority's Environmental Justice Guidance promotes the incorporation of EJ considerations into its programs, policies, and activities to mitigate disproportionate adverse impacts, particularly on minority and low-income populations. The Authority emphasizes the fair treatment and meaningful involvement of people of all races, cultures, and income levels, including minority and low-income populations, from the early stages of transportation planning and investment decision-making through design, construction, operations and maintenance." Unfortunately, the Authority has unfairly excluded untold thousands of people of all races and cultures from having any meaningful involvement in the early stages of the project's planning, design and decision making processes.

L015-37 Since the Authority's inception, the project has violated provisions of EJ that are mandated by NEPA. Property owners whose properties will be impacted by the High Speed Rail project were not officially notified by the Authority that their properties were at risk of being taken or otherwise impacted until July 19, 2012. Stakeholder notification should have been provided much earlier to comply with EJ provisions mandated by NEPA.

The untimely notification by the Authority unjustly prohibited impacted stakeholders from participating in the project planning process. Impacted property owners have been excluded from attending workshops and meetings held by the Authority concerning alignment alternatives. This inexcusable oversight denied stakeholders privileged position status and prohibited stakeholders their right to participate in identifying impacts on the surrounding environment. Stakeholders have been

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- L015-37 unjustly denied the opportunity to review and make comments on EIR documents and Authority Business Plans.
- L015-38 Thousands of stakeholders throughout California were unjustly denied the opportunity to attend Authority meetings held prior to July 19, 2012 because the Authority did not notify property owners specifically that plans were being made to take, partially take or otherwise impact their properties in order to make right of way for the project. This is a purposeful and egregious omission on the part of the Authority and violates the intent of federal EJ provisions mandated by NEPA.
- L015-39 There are over 4,000 pages of RDEIR documents for the Fresno to Bakersfield California High Speed Rail segment and over 30,000 pages of documents which are directly related to the Program and Project Level EIRs. However, less than 4,800 pages of the documents have been provided on line and on CD for the purpose of review and comment on the Fresno to Bakersfield portion of the project. The 4,800 pages that were included in the CD make over 150 references to more detailed information in the form of Technical Reports, yet those reports are not included on the CD. The reports are not available locally in libraries. In fact, the reports are only available on the HSRA's website. Most reports are so large that they require not only a computer and access to the internet, but high speed access to the internet. The reports contain relevant information that is necessary for the public to fully evaluate all of the environmental impacts caused by the project. The Authority's failure to provide all relevant and necessary information to the public has denied stakeholders the ability to effectively review and comment on the environmental impacts of the project and has violated the intent of EJ.
- L015-40 The Authority has not provided hard copies of RDEIR documents written in Spanish, even though a large percentage of impacted property owners who own properties in the planned alternative alignments are Hispanic. In fact, very few Authority documents have been provided in Spanish. This violates the intent of EJ provisions mandated by NEPA and has denied Spanish speaking stakeholder's privileged position status.
- L015-41 Potentially impacted property owners have been unjustly denied an opportunity to participate in formulation of feasible project alternatives and appropriate mitigation. It is a violation of EJ to exclude the public from being adequately informed in such a way that they can intelligently weigh the environmental consequences of all contemplated action, and have an appropriate voice in the formulation of all decisions made by the Authority. The Authority has not publicized the addresses of impacted properties in the planned rail alignment nor has the Authority disclosed whether the impacted properties are residential, business, church, industrial or publicly owned.
- L015-42 The brief 60 day review and comment periods allowed by the Authority for the public, government and other agencies to respond to previous environmental impact and study documents and business plans was so unreasonably short that it effectively precluded any meaningful opportunity for informed agency and public participation. Many state agencies, legislators, congressional representatives, community organizations, city and county officials, businesses and individuals requested a review and comment extension last year, but the Authority ignored them all. The unreasonable 60 day review and comment periods have violated the Authority's duty to ensure informed public participation in the environmental review process. The 60 day review and comment periods are insufficient for a project of this magnitude, cost and complexity. The Authority should allow much longer EIR and Business Plan review and comment periods. We recognize that the Authority did grant a 30 day comment period extension for the current Fresno to Bakersfield RDEIR.

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- L015-43 Save Bakersfield Committee respectfully requests that the Federal Railroad Administration, the Army Corps of Engineers, the Congress of the United States, the Environmental Protection Agency, and the California State Senate, conduct comprehensive investigations of the numerous and egregious violations of NEPA regulations we have addressed and take measures to reverse and mitigate the widespread and severe damage those violations have caused to untold thousands of people unjustly denied their EJ rights and other NEPA provisions by the CHSRA's denial of public participation in the NEPA process. Save Bakersfield Committee requests the FRA withdraw the EIS during the investigation and make certain the Authority has fully complied with NEPA. The FRA must reverse, correct and mitigate all damages caused to the planning process prior to making any decision to approve federal funding for the project.
- L015-44 Save Bakersfield Committee is convinced that the only possible remedy to reverse, mitigate and correct the numerous and severe violations the CHSRA has caused to the NEPA process is to renew the high speed rail project scoping and planning process and do so in strict accordance to all provisions of NEPA law.
- L015-45 **FINITE PROJECT DESCRIPTION**  
  
The Authority identifies several possible alignment and Heavy Maintenance Facility alternatives. Is the project's failure to identify an accurate, stable and fixed project description ambiguous and contrary to NEPA and CEQA guidelines? NEPA and CEQA provisions mandate that an EIR/S document identify which alignment is the proposed project and which alignments are project alternatives. Project alternatives as defined under CEQA and NEPA are intended to avoid or substantially reduce the significant impacts of the proposed project. The failure to identify the proposed project is due to the fact that the project has not reached a point that allows for meaningful environmental review.  
  
(1) Does CEQA require a project level document have a stable, finite project description?  
(2) Why is there a disclaimer stating "Preliminary Draft/Subject to Change-HST Alignment Is Not Determined" and how can the EIR/S document be project ready with the above mentioned disclaimer?  
(3) Does the fact that a number of critical studies have not been completed and the analyses of several significant impacts have been deferred prove that effective environmental review is premature?
- L015-46 **BAKERSFIELD CITY IMPACTS**  
  
(1) Why did the EIR state that local agencies endorsed the Truxtun downtown station, when concepts considered desirable prior to full evaluation of environmental effects should not preclude consideration of CEQA alternatives within an EIR that might be effective in avoiding or reducing significant environmental effects?  
(2) Good access of local mass transit is not dependant on a downtown station location, so shouldn't an alternative station location outside our metropolitan Bakersfield area be considered as an alternative in the EIR and wouldn't that alternative meet the provisions of Prop-1A?  
(3) Why does the project destroy so much of downtown Bakersfield when other less destructive alternative rail alignments could have been studied?

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- L015-47 (4) Does widespread and severe destruction of a major portion of a city and impacts to culture and quality of life caused by that destruction, violate CEQA and NEPA?
- (5) Why is the authority ignoring the City of Bakersfield's concerns and suggestions?
- (6) Why haven't all of the City of Bakersfield's comments for last year's public comment on the Fresno-Bakersfield EIR been included or addressed in the revised draft EIR?
- L015-48 (7) Why are the distinct and different policies of the Kern County General plan and the Kern County and City of Bakersfield Metropolitan General Plans not incorporated in the EIR/S documents?
- L015-49 (8) Why do the EIR/S documents indicate that the project would have significant construction and operational impacts to the residents of Bakersfield and surrounding communities that would permanently affect the physical environment and quality of life in the region?
- L015-50 (9) Why did the EIR/S not discuss the increase of vehicular exhaust emissions caused by significant parking and supportive transit services around the downtown Bakersfield station?
- L015-51 (10) Does the EIR/S significantly underestimate the vehicle trips for the Bakersfield station and isn't the percentage of trips allocated to peak hours unsupportable?
- L015-52 (11) Why is there no EIR/S of areas east of Oswell Street?
- (12) How can the City of Bakersfield, Kern County officials or the public fully evaluate the impacts to the city without a complete EIR/S document that includes the entire stretch of rail within Bakersfield's metropolitan area?
- L015-53 (13) How many hundreds of millions of dollars of public infrastructure will be destroyed in the Fresno to Bakersfield portion of the project?
- (14) How many hundreds of millions of dollars of public infrastructure will be destroyed in Bakersfield?
- L015-54 (15) Are the EIR/S alignments in direct conflict with alternative "C" of the Centennial Corridor project?
- (16) Does the EIR/S have substantial and numerous potential conflicts with Bakersfield's Thomas Road Improvement projects?
- L015-55 (17) Why should the project proceed when the project would cause hundreds of millions of dollars of damage to Bakersfield city assets without any mitigation being offered?

VIADUCT IMPACTS TO BAKERSFIELD

- L015-56 (1) Will 12 miles of 40' to 90' elevated viaducts cutting through the entire width of Bakersfield greatly increase the distance on both sides of the alignment that aesthetic, sound and vibration impacts will be caused to property owners compared to an alignment constructed at grade outside the Bakersfield community?
- (2) How can the increased amount of aesthetic, sound and vibration impacts caused by the elevated viaducts studied in the EIR not necessitate studies of less impactful rail alignment alternatives outside metropolitan Bakersfield?
- L015-57 (3) Why is the Authority rushing ahead to final engineering design and construction without analyzing feasible alternatives that take into consideration site-specific adverse impacts?
- L015-58 (4) Why are the different grade profiles of the project's elevated infrastructure components not linked to specific properties so that the public can understand how the project will look at a specific Bakersfield location?
- L015-59 (5) Will 12 miles of elevated viaducts in metropolitan Bakersfield and the impacts associated with them cause much more devaluation of properties over a much wider area than an alignment at grade?
- (6) To what extent will devaluation of properties over an extended area caused by elevated trains reduce property tax revenues?

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- L015-60 (7) Why are tens of thousands of Bakersfield citizen's quality of life being unnecessarily diminished by rail viaducts that divide the community from one end to the other and does that violate environmental law?
- L015-61 (8) Will all properties including neighborhoods, homes and businesses located under viaducts in Bakersfield be taken?
- L015-62 (9) What mitigation measures will be implemented to eliminate impacts to properties located within sight and sound of the alignment?
- L015-63 (10) Will properties with severe noise and vibration impacts due to close proximity to the elevated Bakersfield alignment be taken?
- L015-64 (11) What kind of emergency escape systems are planned for the 12 mile stretch of 40' to 90' viaducts in Bakersfield?
- (12) How will passengers exit the trains in an emergency situation on 12 miles of viaduct with elevations of 40' to 90'?
- (13) How will emergency response teams access the trains on viaducts 40' to 90' high over our city?

L015-65 PRIVATE PROPERTY DESTRUCTION

- (1) Why does the EIR not specify the properties that will be taken by the three alternatives or whether properties taken by the project will be partial or total takes?
- (2) How many homes will be destroyed in the Fresno to Bakersfield EIR portion of the project?
- (3) How many people will be displaced in the Fresno to Bakersfield EIR portion of the project?
- (4) How many existing business locations will be destroyed in the Fresno to Bakersfield portion of the project?
- (5) How many existing jobs will be impacted due to destruction of businesses in the Fresno to Bakersfield portion of the project?
- (6) How many existing business locations will be destroyed in the Bakersfield portion of the project due to the three alternative downtown alignments?
- (7) How many existing jobs will be impacted due to destruction of businesses in the Bakersfield portion of the project due to the three alternative downtown alignments?
- (8) How many hundreds of millions of dollars of lost revenues will the Fresno to Bakersfield rail alignments cause due to destruction of existing farm operations, business and industry locations?
- (9) How many hundreds of millions of dollars of lost revenues will the downtown Bakersfield rail alignments cause due to destruction of existing business and industry locations?
- (10) How will destruction of properties in the rail alignments of the Fresno to Bakersfield portion of the project affect local property tax revenues?
- (11) How will devaluation of property values due to the property's close proximity to the rail alignments of the Fresno to Bakersfield portion of the project affect local property tax revenues?
- (12) How will the severe and widespread devaluation of property values that are located within sight and sound distance of the 12 miles of elevated viaducts proposed in the Bakersfield alternative alignments affect local property tax revenues?
- L015-66 (13) Why do the alignment alternatives for the Fresno to Bakersfield portion of the project not follow existing transportation corridors?
- L015-67 (14) Would most of the extremely negative impacts discussed above be eliminated if the project alternatives followed existing transportation corridors as specified in Prop-1A?

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L015-68

SAN JOAQUIN VALLEY INITIAL CONSTRUCTION SECTION AND AMTRAK

The HSRA's plan is to construct an Initial Construction Section (ICS) passenger rail corridor in the San Joaquin Valley and relocate existing Amtrak trains from their existing rail alignment to the ICS. This is not only absurd; it is irresponsible. San Joaquin Valley communities and the rest of the State already have an operational Amtrak system that will be laid to waste by the new ICS portion of the High Speed Rail project. The HSRA plan to relocate Amtrak trains to the ICS will eliminate existing Amtrak passenger rail service to Wasco, Corcoran and Hanford. The priority of a competent and well planned passenger rail system for California must study and construct a passenger rail system that connects the existing Amtrak system from Bakersfield to Los Angeles. A competent passenger rail plan would upgrade existing Amtrak systems in the San Joaquin Valley so that Amtrak trains can travel at speeds of 125 MPH.

L015-69

AIR QUALITY IMPACTS

- (1) Why does the Air Quality Technical report not contain specific quantification of amounts for construction emissions?
- (2) Why does the Air Quality Technical report not contain any analysis for operational emissions?
- (3) Should the public be able to verify methodology and calculations used for the Air Modeling?
- (4) Should the total amounts in tons per year of the construction emissions and operational emissions be included in the Air Quality Technical Report?
- (5) What are the indirect air quality impacts of the employees driving to the trains as operators?
- (6) What are the indirect air quality impacts of passengers driving to and from the trains?
- (7) Why is the entire technical source document on air quality, and how can the accuracy of the information be determined without one?
- (8) Is the Air Quality section of the EIR/S inadequate as it incorrectly presumes that the project will have a low potential for air quality impacts?
- (9) When completed, how many years will it take for air quality impacts caused during the construction process to equal air quality improvement realized by a fully operational green powered electric high speed rail system?
- (10) Is it certain that there will be increased power plant emissions caused by the new 1000MW load required to power the trains in order to generate necessary electricity reserve capacity for home, business and industry use?

L015-70

CONSTRUCTION IMPACTS

- (1) Why are calculations of the trip lengths and mix for construction workers to each location not specifically addressed in the EIR/S documents?
- (2) How can there be no significant differentiating construction impacts between alternatives for transportation and traffic?
- (3) How can the variation in the number of road closures between scenarios vary from 15 to 20 roads without that being a significant difference, and won't that necessitate different mitigation measures?
- (4) What County and unincorporated roads and intersections were analyzed, and what is the mitigation necessary to maintain the current level of service?
- (5) What are the mitigation measures necessary to protect Public Roadways during construction?

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- (6) Explain how the lengthening of Rosedale Highway in Bakersfield will be accomplished to accommodate this project, without a major disruption in vehicle traffic?
- (7) Why have grade separation issues that are a necessary component of the HSR project not been thoroughly addressed in the EIR/S documents?
- (8) Why is there no mitigation for vital connector road closures?
- (9) Why is there an inadequate discussion of mitigation for unimpeded traffic circulation during the construction of the project?

L015-71

SOUND AND VIBRATION IMPACTS

- (1) Why is the Authority rushing ahead to final engineering design and construction without analyzing feasible alternatives that take into consideration site-specific adverse impacts?
- (2) Why does the EIR/S designate "Potential Sound Barriers" on the elevated rail alignment drawings?
- (3) Are Potential Sound Barrier locations specified on the drawings necessary or not?
- (4) Why do the EIR/S documents not specify where installation of building sound proofing will be necessary to mitigate interior noise to adjacent buildings?
- (5) What agency is responsible for determining the necessity of sound barriers and sound proofing of walls?
- (6) What agency is responsible for the costs associated with sight, sound and vibration impact mitigation to adjacent properties?
- (7) Where are the cross sections and dimensions of the sound barriers?
- (8) In addition to steel on wheel and other mechanical noise, will wind noise from the 220 mile per hour trains be effectively mitigated with sound barriers?
- (9) Is it the responsibility of the HSR Authority or lead agency to provide impact analysis and propose mitigation or alternatives to address specific impacts?
- (10) Why did the Authority not provide detailed sound impact analysis and mitigation proposals for all impacted properties in the EIR/S documents?

L015-72

MITIGATION MEASURES

- (1) Why does the EIR/S not discuss what mitigation measures and alternatives are within the jurisdiction of the Authority?
- (2) Why did the Authority not provide detailed impact analysis and mitigation proposals in their EIR/S documents?
- (3) Do the proposed incomplete and ineffective mitigation measures fail to identify mitigation measures with sufficient specificity to gauge their effectiveness and enforceability, and does that violate CEQA requirements?
- (4) Do mitigation measures that are not identified and agreed on make it uncertain that the impacts will be sufficiently mitigated?
- (5) Is it the responsibility of the HSR Authority or lead agency to provide impact analysis and propose mitigation or alternatives to address specific impacts?
- (6) Why did the Authority not provide detailed impact analysis and mitigation proposals in their EIR/S documents?
- (7) Why does the EIR/S not mention the need for overriding consideration for significant Air, Noise, Traffic, Biological Resources, Aesthetics/Visual Resources and Cultural Resources caused by the Bakersfield alignment alternatives?

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NEPA AND CEQA ISSUES

- (1) Is the "No Project" alternative discussion inadequate because there are no facts provided to determine if the no project alternative is or is not environmentally superior, and doesn't that omission violate CEQA guidelines?
- (2) Why do the Revised EIR/S documents not follow the higher standards and guidelines of CEQA concerning format, specific identification of impacts, specific mitigation and other overriding considerations?
- (3) Why do the EIR/S documents fail to comply with the fundamental procedural and substantive requirements of NEPA and CEQA?
- (4) Why is there no specific project description that includes the project's technical, economic or environmental characteristics to provide the basis for discussion of the environmental effects of the project and doesn't that violate CEQA guidelines?
- (5) If environmental review of a project is premature until the design is 30% complete, doesn't the 15% design stage of the alternatives make proper environmental review of the project impossible?
- (6) Is the project description uncertain and incomplete and doesn't that violate NEPA and CEQA?
- (7) When the EIR/S discusses environmental impacts in general terms and fails to quantify the extent of the project's impacts, does it violate NEPA and CEQA requirements for analysis of potential impacts to be reasonably thorough?
- (8) Do NEPA and CEQA require the Authority to provide meaningful responses to public agency comments?
- (9) Do NEPA and CEQA require the Authority to respond to all significant environmental issues raised in EIR/S comments by providing detailed, reasoned, good-faith analysis of the issues raised?
- (10) Do NEPA and CEQA require the Authority to respond to the reasoned, factually supported responses made by responsible agencies and experts who drafted the Kern County and Bakersfield City EIR Comments?
- (11) Does the EIR/S discussion of potential environmental impacts that consist of conclusory statements not supported by scientific data make the EIR/S susceptible to legal challenge?
- (12) Why should the project proceed when the EIR document did not address the requirements of State law under CEQA?
- (13) Why does the EIR violate the requirements of CEQA by damaging Mercy Hospital in Bakersfield?
- (14) Why does the EIR violate the requirements of CEQA by damaging churches and schools in Bakersfield?
- (15) Why does the EIR violate the requirements of CEQA by taking a huge swath through the entire city of Bakersfield?
- (16) Why does the EIR violate the requirements of CEQA by potentially damaging properties east of Oswell Street and why weren't those areas properly noticed, clarified or studied?
- (17) Do NEPA and CEQA require that an EIR/S document be written in plain language with appropriate graphics so decision makers and the public can rapidly understand the documents?

L015-74

OTHER QUESTIONS AND COMMENTS

- (1) Why does the Revised Draft 2012 EIR/S not meet the statutory requirements of Assembly Bill 3034?
- (2) Due to lack of guaranteed funding, shouldn't travel demand and ridership forecast be studied for a scenario where no future extensions beyond the Initial Construction Section are ever built?

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- (3) Why did the EIR/S not address alternative technology such as Maglev in the EIR/S documents, and wouldn't that technology minimize or avoid many significant impacts?
- (4) Why were the EIR/S documents presented as project level rather than program level documents which require a greater level of assessment and review?
- (5) Why do the maps contained in the EIR appear to be purposely unclear?
- (6) Why were there no reasonable alternatives for the Bakersfield City area contained in the EIR?
- (7) What are the costs related to adding the reserve electricity production necessary for the HSR project and where will the funds come from?
- (8) How can the Authority proceed with the project when the availability of funding is highly uncertain?
- (9) Why does the Authority overstate the alternative cost estimates for other transportation upgrades?
- (10) What are the correct costs of alternative transportation upgrades?
- (11) How does the Authority quantify that High-Speed Rail is a superior alternative to other transportation investments?
- (12) Would providing alternative transportation infrastructure upgrades be a better value for the public?
- (13) Why should we build the project when the independent benefits of the Initial Construction Segment from north of Fresno to Bakersfield is unlikely to justify the expense?
- (14) Why should the project proceed when the Bakersfield City Council confirmed its complete and unwavering opposition to the Authority's entire High Speed Rail project as it is currently proposed?
- (15) Why should the project proceed when the Kern County Board of Supervisors resolved to oppose the high speed rail project as planned?
- (16) Why should the high speed rail project proceed when there is no revenue source for a completed high speed passenger rail system?
- (17) Why should the high speed rail project proceed when there is no funding to electrify the ICS track?
- (18) Why should the project proceed when the Authority cannot clarify how far south the track will be built?
- (19) Why should the project proceed when current funding for the ICS track will not be used for high speed trains?
- (20) Why should the project proceed when the ICS has no high speed passenger rail system independent utility?
- (21) Does the Initial Construction Section of the project that is currently being studied violate provisions of Proposition 1A?
- (22) Is spending \$6 billion on a new San Joaquin Valley Amtrak corridor or ICS a waste of scarce tax dollars?
- (23) After prolonged consultations with the Authority, why did the Authority ignore virtually all suggestions made by Bakersfield City staff?
- (24) Why should the project proceed when the project would cause hundreds of millions of dollars of damage to Bakersfield city assets without any mitigation being offered?
- (25) Why is the EIR drafted in such a manner that it is too difficult for the average citizen to understand?
- (26) Why does the EIR ignore the significant impacts created by the project?
- (27) Why hasn't the Authority responded to Bakersfield City's or Kern County's comments related to the deficiencies of the project?
- (28) Why does the project unnecessarily threaten residences, businesses, churches, medical facilities, Rabobank Arena, new city redevelopment projects and the city corporation yard in Bakersfield?

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- L015-81 | (29) Why does the project conflict with current and future TRIP projects in Bakersfield?
- L015-82 | (30) Why should the project proceed when it is unlikely that there will be any funding to extend the track to usable termination points?
- L015-83 | (31) Why should the project proceed when issuance of bonds will cause the state deficit to grow?
- L015-84 | (32) Why should we build another Amtrak corridor in the San Joaquin Valley when the costs will cause raids on local services to escalate?
- L015-85 | (33) How does relocating Amtrak from its existing BNSF alignment to the ICS make the project a high speed rail project?
- L015-86 | (34) Does relocation of Amtrak to the ICS violate Prop-1A?
- L015-87 | (35) Is it a huge waste of tax dollars to eliminate a functioning Amtrak corridor?
- L015-88 | (36) Why should the project proceed when the cost of the project has multiplied while the scope of high speed rail construction has decreased or is even non-existent, and isn't the current project vastly different from the project voters approved in 2008?
- L015-89 | (37) Will the cost of the project found in future HSR Business Plans continue to rise as the amount of high speed rail construction continues to decrease or be eliminated?
- L015-90 | (38) Why should the project proceed when future revenues are based on flawed ridership projections?
- L015-91 | (39) Why should the project proceed when all recent voter polls show overwhelming statewide opposition to the project?
- L015-92 | (40) Why should the project proceed when there are so many fiscal, legal and logistical concerns which have not been sufficiently addressed by the Authority?
- L015-93 | (41) Why should the project proceed when there are so many errors and omissions in the EIR and business plan?
- L015-94 | (42) Why should the project proceed when there are so many flaws which if constructed as designed, would permanently and adversely impact the City of Bakersfield and the citizens of Kern County?
- L015-95 | (43) Why does the project not remotely resemble what voters approved in Prop-1A and doesn't that put the project at risk of successful litigation to stop it?
- L015-96 | (44) Why will the 130 mile ICS that was previously called the "High Speed Rail Test Track" have no operating high speed trains on it?
- L015-97 | (45) Does a new Amtrak corridor satisfy the intention of "Independent Utility" mandated in the high speed rail Prop-1A documents?
- L015-98 | (46) Is it illegal to use Prop-1A bonds to finance the bookend (bay area and So Cal) upgrades?
- L015-99 | (47) Why should the project be funded using American Recovery and Reinvestment Act money when more cost effective and beneficial infrastructure projects are needed?
- L015-100 | (48) Why should the project proceed when a significant, yet to be determined additional amount of debt would be incurred by the state as a result of the Authority's proposed HSR project?
- L015-101 | (49) Why should the project proceed when the current secured funding only provides for a track from Borden to a southerly point not yet clarified by the Authority?
- L015-102 | (50) Why should the project proceed when the three alternative rail alignments through metropolitan Bakersfield contain comparable negative impacts to the community and are not true alternatives as described per NAPA and CEQA?
- L015-103 | (51) Why should the project proceed when the proposed alignments will damage significant amounts of local residences, businesses, schools, churches, historical structures, culturally significant structures, freeway projects, open spaces and other basic critical infrastructure?
- L015-104 | (52) Why should the project proceed when the proposed alignments would ultimately damage hundreds of millions of dollars in Bakersfield City assets, with no significant mitigation?
- L015-105 | (53) Why should the project proceed when the loss of conventions and events at Rabobank will significantly impact transient occupancy tax and sales tax revenues in Bakersfield?

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- L015-92 | (54) Why should the project proceed when the HSR plan proposes a station location that would negatively impact numerous significant structures within downtown Bakersfield?
- L015-93 | (55) Why should the project proceed when the proposed station is over 5 times the size of the station that was first envisioned in the primary study?
- L015-94 | (56) Why should the project proceed when the EIR does not adequately address mitigation in all applicable areas?
- L015-95 | (57) Why should the project proceed when the Authority provided insufficient review time for the Revised Draft EIR document?
- L015-96 | (58) Why should the project proceed when the EIR implies substantial negative impacts to East Bakersfield, but does not provide detail or mitigation for said impacts?
- L015-97 | (59) Why should the project proceed when Bakersfield City staff relayed concerns with the Authority in person, via e-mail and in phone conversations in recent years, but those concerns were not adequately addressed?
- L015-98 | (60) Why should the project proceed when numerous citizens of Bakersfield and Kern County have addressed the City Council and other local legislative bodies and elected officials with numerous and varied significant concerns regarding the Authority's proposal?
- L015-99 | (61) Why were the numerous comments submitted by the public for the August 2011 public comment on the Fresno-Bakersfield EIR not included or addressed in the revised draft EIR?
- L015-100 | (62) Why should the project proceed when there are no credible sources of adequate funding for completing an operational high speed rail system in the Business Plan?
- L015-101 | (63) Why should the project proceed when there isn't a definitive business model?
- L015-102 | (64) Why should the project proceed when there are not appropriate management resources within the Authority?
- L015-103 | (65) Why is the HSR Revised 2012 Business plan so flawed that the state appointed Peer Review Group did not recommend the Legislature approve the appropriation of bond proceeds for the HSR project?
- L015-104 | (66) Why should construction of the High Speed Rail project begin when the project as planned represents an immense financial risk to the State of California?
- L015-105 | (67) Why were hypothetical scenarios used to represent purported growth forecasts and policy for Kern County in stead of using reasoned analysis of impacts that are location specific for a project level document?
- L015-106 | (68) Why were Kern County's comments for last year's public comment on the Fresno-Bakersfield EIR not included or addressed in the revised draft EIR?

END OF COMMENT

Respectfully Submitted,

Jeff Taylor  
Chair, Save Bakersfield Committee

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### **L015-1**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-07, FB-Response-GENERAL-16.

### **L015-2**

Refer to Standard Response FB-Response-GENERAL-08, FB-Response-GENERAL-16, FB-Response-SO-01.

The Authority appreciated the comments that the Planning and Community Development Department provided in October 2011 on the Draft EIR/EIS and incorporated information requested in those comments into the Revised DEIR/Supplemental DEIS.

### **L015-3**

The Air Quality Technical Report was made available on the Authority website at the same time as the Notice of Availability was released for the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS. The Notice of Availability identified that the Air Quality Technical Report was available for public review on the Authority's website. The introduction to Section 3.3, Air Quality and Global Climate Change, of the EIR/EIS states that the Air Quality Technical Report provides more detailed information on the methodology used for the air quality analysis and the results of the air quality analysis. The Statewide Program EIR/EIS is available on the Authority website. The document has been available on the website since it was released to the public in 2005. Summary data of emissions have been added to Section 3.3 in the Final EIR/EIS.

The operational emissions evaluated for the project included space heating and facility landscaping for stations, energy consumption for station lighting, and carbon monoxide (CO) emissions from the parking structures and employee and passenger traffic.

Appendix A of the Air Quality Technical Report provides tables that list emissions from all phases and components of construction. The referenced computer runs are the raw data that were used for input to the tables in Appendix A.

The Final EIR/EIS contains the analysis of ground-level concentrations of criteria pollutants from project construction and operation.

### **L015-4**

The HST will not preclude Kings County from achieving vehicle miles traveled (VMT) reduction goals per SB 375. The percentages stated were calculated for the No Project Alternative based on analysis provided by the Authority. The Authority intends to support VMT reduction efforts by providing an alternative mode of inter-regional travel and encourage transit-oriented development.

### **L015-5**

The general criterion of "an increase in traffic that is substantial in relation to the existing traffic load and capacity" is applicable to the project-level analysis, as follows. To appropriately apply this general criterion to detailed analysis of each specific roadway system element (i.e., roadway segments, signalized intersections, and unsignalized intersections), the existing local standards and thresholds used in traffic analyses for potential station locations in 26 cities in 16 counties were examined. With that information, uniform, specific methods and criteria for traffic analysis of each roadway system element were derived at the level of detail necessary for project analysis. These include deterioration in level of service (LOS) to below D, addition of 0.04 to the volume-to-capacity (V/C) ratio for roadway segments already operating or projected to operate at LOS E or F (i.e., urban areas where a majority of the HST stations are anticipated to be located); and increase in delay of 4 seconds at signalized intersections and of 5 seconds at unsignalized intersections.

### **L015-6**

Section 2.4.1, No Project Alternative -- Existing and Planned Improvements, of the Final EIR/EIS provides the projected population growth according to the California Department of Finance (DOF) for the four counties in the Fresno to Bakersfield study area (DOF 2007, 2010).

### **L015-7**

The EIR/EIS does not discuss or cite similarities between the San Joaquin Valley and the Colorado Department of Transportation, but the EIR/EIS references a 2007 study conducted by the Federal Transit Administration and Colorado Department of Transportation involving a geographic information system (GIS) analysis of 50 years of land use trends based on digitized historical aerial photos and actual census data to

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-7

determine that the gross use of an acre of land supported an average of 10 persons (USDOT et al. 2007). This estimate accounts for commercial, industrial, institutional, and other components of growth that are not captured in a simple calculation of residences per acre. The application of the study's findings to the San Joaquin Valley, combined with growth projections provided by the California Department of Finance (DOF 2007, 2010), as discussed for the No Project Alternative in Chapter 2, Alternatives, of the Final EIR/EIS, results in an estimated need for approximately 173,000 acres of development under the No Project Alternative.

### L015-8

The Summary of the Final EIR/EIS for the Fresno to Bakersfield Section has been revised in response to your comment. The discrepancy in the Summary has been corrected, and the discussion there is now consistent with the discussion in Chapter 2, Alternatives, and the other references to vehicle miles traveled (VMT) and population in the region that are included in the body of the EIR/EIS.

### L015-9

Section 15148 of the California Environmental Quality Act (CEQA) Guidelines states: "Preparation of EIRs is dependent upon information from many sources, including engineering project reports and many scientific documents relating to environmental features. These documents should be cited but not included in the EIR."

### L015-10

The statement that the percentage of transit passengers arriving/departing transit stations by car and parking decreases as land use development and population around the stations increases is supported by the station access mode share at transit systems in California and across the country.

A sample of the research that supports this statement includes:

- Robert Cervero, *Rail Access Modes and Catchment Areas for the BART System* (Berkeley, CA: University of California Berkeley, Institute of Urban and Regional Development, September 1,

### L015-10

- 1995), <http://www.escholarship.org/uc/item/0m92j0kr> (accessed May 2013) (Cervero 1995).
- Chris Hale, *Station Access and the Modern Transit System* (Adelaide, Australia: Australasian Transport Research Forum 28, 30 September 2011), [www.patrec.org/atrf.aspx](http://www.patrec.org/atrf.aspx), (accessed May 2013) (Hale 2011).
- Hollie M. Lund, Robert Cervero, and Richard W. Willson, *Travel Characteristics of Transit-Oriented Development in California* (January 2004), [http://www.bart.gov/docs/planning/travel\\_of\\_tod.pdf](http://www.bart.gov/docs/planning/travel_of_tod.pdf) (accessed May 2013) (Lund et al. 2004).
- Evans, John E. (Jay) IV, and Richard A. Pratt, *Transit Oriented Development: Traveler Response to Transportation System Changes*, Chapter 17, TCRP Report 95 (Washington, DC: Transportation Research Board, 2007), [http://www.fta.dot.gov/documents/Transit\\_Oriented\\_Development\\_-\\_Traveler\\_Response\\_to\\_Transportation\\_System\\_Changes\\_TCRP\\_Report\\_95.pdf](http://www.fta.dot.gov/documents/Transit_Oriented_Development_-_Traveler_Response_to_Transportation_System_Changes_TCRP_Report_95.pdf) (accessed May 2013) (Evans and Pratt 2007).
- Levinson, Herbert S, Paul Ryus, Joseph L. Schofer, Conor Semler, Jamie Parks, Kathryn Coffel, David Sampson, and Carol Kachadoorian. *Guidelines for Providing Access to Public Transportation Stations*, TCRP Report 153 (Washington, DC: The National Academies Press, 2012). [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_153.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_153.pdf) (accessed May 2013) (Levinson et al. 2012).
- Center for Neighborhood Technology, *Paved Over: Surface Parking Lots or Opportunities for Tax-Generating, Sustainable Development?* (Center for Neighborhood Technology, November 2006), <http://www.cnt.org/repository/PavedOver-Final.pdf> (accessed May 2013) (Center for Neighborhood Technology 2006).
- American Public Transportation Association (APTA), *Defining Transit Areas of Influence*, APTA Standards Development Urban Design Working Group, APTA SUDS-UD-RP-001-09 (Washington, DC: APTA, December 31, 2009), [http://www.aptastandards.com/Portals/0/SUDS/SUDSPublished/APTA%20SUDS-UD-009-01\\_areas\\_of\\_infl.pdf](http://www.aptastandards.com/Portals/0/SUDS/SUDSPublished/APTA%20SUDS-UD-009-01_areas_of_infl.pdf) (accessed May 2013) (APTA 2009).
- Union of International Railways, *High Speed and the City* (Union of International Railways, September 2010), [http://www.uic.org/IMG/pdf/20101117\\_highspeed\\_thecity\\_finalreport.pdf](http://www.uic.org/IMG/pdf/20101117_highspeed_thecity_finalreport.pdf) (accessed May 2013)

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### L015-10

sed May 2013) (Union of International Railways 2010).

### L015-11

The Vision California report, the results of which are cited in Section 2.7, Additional High-Speed Train Development Considerations, of the Final EIR/EIS, is based on the Rapid Fire model. The Rapid Fire model is designed to produce and evaluate statewide, regional, and/or county-level scenarios across a range of metrics. The output metrics include land consumption, infrastructure cost, transportation system impacts and costs, public health impacts related to transportation emissions, and building energy, cost, and emissions.

Rapid Fire is a spreadsheet-based scenario-planning model. Therefore, it requires users to translate existing or proposed plans into development quantities and types, which are input into the spreadsheet. As such, a user of Rapid Fire can input full build-out of both the Kern County and the City of Bakersfield General Plans in the model to obtain its output metrics for those scenarios. Additional information about the model can be found at:

<http://visioncalifornia.org/Rapid%20Fire%20V%202%200%20Tech%20Summary.pdf> (Authority and SGC 2011a).

The scope of the Vision California report is to inform the critical state and regional decisions regarding infrastructure investments by expressing the consequences of different scenarios. For the Vision California report, the Rapid Fire model was used to analyze a set of statewide growth scenarios. Each scenario pairs one of three district land use options with one of two policy packages and accommodates the same amount of projected population and job growth numbers to the years 2020, 2035, and 2050. The "Business as Usual" scenario uses trend land use patterns of the past decades to project growth patterns through 2050. The full Vision California report can be found at: <http://visioncalifornia.org/Vision%20California%20-%20Charting%20Our%20Future%20-%20Report%20-%20June%202011.pdf> (Authority and SGC 2011b).

The Rapid Fire model can and has been used by cities and Metropolitan Planning Organizations (MPOs) in their plan development. The Southern California Association of Governments used Rapid Fire to develop its Regional Transportation Plan/Sustainable

### L015-11

Community Strategy, which was adopted in 2012. Likewise, the City of Fresno used Rapid Fire to compare the outputs of multiple General Plan alternatives as part of its alternative selection process for its new General Plan, currently in environmental review.

The Urban Footprint model has been developed to a 1.0 release and is being adopted for use by MPOs in California. Urban Footprint includes the ability to import local and county land use plans into the model. The model is currently being adopted by several MPOs for use in developing the next round of their Regional Transportation Plans/Sustainable Community Strategies.

### L015-12

The general criterion of "an increase in traffic that is substantial in relation to the existing traffic load and capacity" is applicable to the project-level analysis, as follows: To appropriately apply this general criterion to detailed analysis of each specific roadway system element (i.e., roadway segments, signalized intersections, and unsignalized intersections), the existing local standards and thresholds used in traffic analyses for potential station locations in 26 cities in 16 counties were examined. With that information, uniform, specific methods and criteria for traffic analysis of each roadway system element were derived at the level of detail necessary for project analysis. These include deterioration in level of service (LOS) to below D, addition of 0.04 to the volume-to-capacity (V/C) ratio for roadway segments already operating or projected to operate at LOS E or F (i.e., urban areas where a majority of the HST stations are anticipated to be located); and increase in delay of 4 seconds at signalized intersections and of 5 seconds at unsignalized intersections.

### L015-13

Reference has been updated to "21st" in the Final EIR/EIS.

### L015-14

It is true that the Golden Empire Transit District (GET) system has updated bus routes and schedules. Impacts and effects to the system would be the same as those stated in the Revised DEIR/Supplemental DEIS, and therefore the existing text will remain in the

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-14**

Final EIR/EIS.

### **L015-15**

The general criterion of “an increase in traffic that is substantial in relation to the existing traffic load and capacity” is applicable to the project-level analysis, as follows: To appropriately apply this general criterion to detailed analysis of each specific roadway system element (i.e., roadway segments, signalized intersections, and unsignalized intersections), the existing local standards and thresholds used in traffic analyses for potential station locations in 26 cities within 16 counties were examined. With that information, uniform, specific methods and criteria for traffic analysis of each roadway system element were derived at the level of detail necessary for project analysis. These include deterioration in LOS to below D, addition of 0.04 to the volume-to-capacity (V/C) ratio for roadway segments already operating or projected to operate at LOS E or F (i.e., urban areas where a majority of the HST stations are anticipated to be located), and increase in delay of 4 seconds at signalized intersections and of 5 seconds at unsignalized intersections.

### **L015-16**

Table 3.2-13 would be the correct reference. Text will be revised in the Final EIR/EIS.

### **L015-17**

Although the Intersection #23 would experience an average delay increase of 8.0 seconds, the level of service (LOS) will remain at D, an acceptable level of service. As stated in Sections 3.2.2.4 and 3.2.3.5, an increase in delay at an intersection by 4 seconds or more is an impact only for intersections projected to operate at LOS E or F under baseline conditions.

### **L015-18**

Additional road width is not required to implement the proposed mitigation. The road will remain as two lanes, and would provide one exclusive left-turn lane and one shared left/right-turn lane at the intersection.

### **L015-19**

The HST project is not predicted to contribute traffic to the turning movement of eastbound Golden State Avenue onto eastbound SR 178.

### **L015-20**

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue to coordinate with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### **L015-21**

Refer to Standard Response FB-Response-GENERAL-08.

Coordination with Kern County Development Services will continue through the design and procurement process, with the intention of obtaining agreement on the applicable design speeds.

### **L015-22**

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue to coordinate with local agencies on this issue through the design and procurement process.

### **L015-23**

Refer to Standard Response FB-Response-GENERAL-08.

Additional coordination is ongoing with the Greater Bakersfield Separation of Grade District and other local agencies to agree on the required level of roadway improvements associated with the HST project.

### **L015-24**

The technical reports were posted on the Authority's website and were available for public review at the same time the Revised DEIR/Supplemental DEIS was circulated for

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-24**

public review. The Notice of Availability announcing the circulation of the Revised DEIR/Supplemental DEIS stated that the technical reports were available on the website. Downloading or viewing the technical reports from the website required the same equipment and software as using the CD for the Revised DEIR/Supplemental DEIS. Therefore, these technical reports were as available to the public as the environmental document, and there is no need for recirculation.

"Redacted" means that information was removed from technical reports to protect resources. The locations of wetlands and populations of special-status species were removed from the Biological Assessment and the Wetlands Delineation Report, which were available to the general public. This information was provided to experts in the field on request.

### **L015-25**

The Authority circulated the technical studies used in the development of the Revised DEIR/Supplemental DEIS. The Revised DEIR/Supplemental DEIS includes meaningful analysis of the project in a manner that the public is provided with a usable roadmap for understanding the project, project impacts, and mitigation measures. The Planning and Community Development Department has not provided substantive comments that necessitate the recirculation of the environmental document.

Section 3.3.6 of the EIR/EIS provides a comprehensive analysis of air quality impacts associated with project construction and operation. This analysis identifies the years in which project construction would result in emissions of criteria pollutants that exceed either general conformity or SJVAPCD CEQA thresholds, evaluates compliance of project construction with air quality plans, evaluates the impacts of material-hauling emissions outside of the San Joaquin Valley Air Basin, and assesses greenhouse gas (GHG) emissions during construction. The analysis of construction-related air quality impacts goes on to address asbestos and lead-based paint exposure during demolition operations, localized exposure to criteria pollutant emissions during construction of alignment facilities, localized exposure to criteria pollutant emissions from concrete batch plants, and localized exposure to emissions from construction of the heavy maintenance facility and maintenance-of-way facility. Section 3.3.6 then addresses air quality effects associated with project operations, including quantification of the

### **L015-25**

statewide reduction in criteria pollutant emissions associated with the project, an analysis of GHG emissions from operations, localized air quality impacts from train operations, localized impacts from mobile source air toxics emissions, an analysis of impacts from vehicle carbon monoxide and PM10/PM2.5 emissions associated with project-related traffic, localized air quality impacts from operation of the heavy maintenance facility, a discussion of odor impacts from project operations, and project compliance with air quality plans and conformity rules.

Project technical reports were circulated with the EIR/EIS. The technical reports were available on the Authority's website at the time of the release of the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS. The availability of these technical reports was announced in the Notice of Availability circulated to public agencies and members of the public.

Quantitative data from technical reports were provided in the EIR/EIS where such data would inform the general public of the nature and magnitude of project-related impacts in an easily understandable way. Where such quantitative technical data were judged not to be informative to the lay public, the data were not included in the EIR/EIS but provided in the technical reports.

### **L015-26**

The attached comments have been responded to in Volume 5 of this Final EIR/EIS.

### **L015-27**

Project-related impacts to emergency responders are discussed in Section 3.11 of the Revised DEIR/Supplemental DEIS. Construction procedures and techniques will be no different than for any project involving fabrication of reinforced-concrete structures, and there should be no need for specialized equipment for emergency responders. This comment provides no evidence that such equipment would be required.

As indicated in Section 3.11.6, fire/life safety programs (FLSPs) will be prepared that implement the requirements set forth in the Federal Rail Safety Act. FLSPs address the safety of passengers and employees during emergency response. The FLSP would address the needs of disabled persons. An FLSP will be developed with the Office of the

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-27

State Fire Marshal (authority having jurisdiction for state properties and coordinated with local emergency response organizations, including Kern County Fire Department, to provide them with an understanding of the rail system, facilities, and operations, and to obtain their input for modifications to emergency response operations and facilities, such as evacuation routes.

There are no tunnels planned for the Fresno to Bakersfield Section of the HST. No tunnels are described in Chapter 2 of the EIR/EIS.

### L015-28

As indicated in Section 3.11 of the EIR/EIS, an accident resulting in an HST leaving the right-of-way could result in substantial casualties, primarily among the passengers and crew of the train. Because the HST is electrically powered and only carries passengers, such an accident would not result in a fire, explosion, or release of toxic gases. As discussed in Impact S&S #4 in Section 3.11.5.3 of the EIR/EIS, the design approach to high-speed trains is to prevent accidents and contain the train within the right-of-way. This has proven quite successful over the life of HSTs throughout the world. Since 1964 and the inauguration of the first HST service in Japan, Japanese HST trains (the Shinkansen) have maintained a record of no passenger fatalities or injuries due to train accidents, including derailments or collisions. In France, HSTs (the TGV) have been operating for 27 years, and currently carry more than 100 million passengers a year. Like Japan, the French HST system has not had a single HST-related passenger fatality on its dedicated HST trackway, which is similar to the dedicated trackway proposed for the California HST System. Over the past 5 decades there have only been two HST accidents that have resulted in trains leaving the right-of-way and causing substantial casualties: one in Germany and one in China. The Chinese accident resulted from poor engineering design, quality control, and staff training. The Germany accident was associated with a wheel-design flaw that has since been corrected. Therefore, while a major HST accident would be severe, the probability of such an accident is extremely low and does not warrant the level of equipment and training called for in this comment.

Kern County has prepared a Multi-Hazard Mitigation Plan (2005) in accordance with the federal Disaster Mitigation Action of 2000. In accordance with that law, this plan will be updated every 5 years. The Authority would work with Kern County as construction of

### L015-28

the HST proceeded in the county to include the HST in the county's hazard mitigation planning. If invited, the Authority would participate in the county's Hazard Mitigation Planning Committee.

### L015-29

As indicated in Section 3.11.6 of the Revised DEIR/Supplemental DEIS, the Authority will prepare fire/life safety programs for the project addressing the issues raised in this comment. The FLSP will be developed with the Office of the State Fire Marshal (authority having jurisdiction for state properties) but also coordinated with Kern County Fire Department, as well as other emergency responders along the HST system. The Authority will have a qualified fire protection specialist that can provide assistance to the county.

### L015-30

Refer to Standard Response FB-Response-GENERAL-07, FB-Response-GENERAL-08, FB-Response-GENERAL-16.

The Authority and FRA have exceeded the legal requirements of NEPA and Executive Order 12898 in obtaining public and local authority input on the project, identifying environmental justice communities potentially affected by the project, and informing and involving them in the project process. This comment provides no substantive evidence that the planning and scoping for the project was not in compliance with NEPA.

The Authority and FRA have undertaken substantial outreach to Environmental Justice communities during the preliminary engineering and environmental review of the Fresno to Bakersfield Section. Materials translated into Spanish have included the Executive Summary, Notice of Preparation, a summary of the highlights of the Draft EIR/EIS, an overview brochure of the Draft EIR/EIS, and comment cards at the public workshops and hearings. Also, a multi-lingual, toll-free hotline was made available for public comments and requests. Section 3.12 of the EIR/EIS describes the project benefits, regional and localized effects, and project impacts to Environmental Justice communities. These efforts meet the intent and requirements of Executive Order 12898.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-31

Refer to Standard Response FB-Response-GENERAL-07, FB-Response-GENERAL-08, FB-Response-GENERAL-16.

The Authority and FRA have exceeded the legal requirements of NEPA and Executive Order 12898 in obtaining public and local authority input on the project, identifying potentially affected Environmental Justice communities, and informing them about and involving them in the project process.

### L015-32

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-GENERAL-02.

### L015-33

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-SO-07, FB-Response-GENERAL-25.

As described in Section 1.5, Tiering of Program EIR/EIS Documents, of the Final EIR/EIS for the Fresno to Bakersfield Section, in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA 2005), the Authority and FRA selected the BNSF Railway route as the preferred alternative for the HST System between Fresno and Bakersfield. Therefore, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF Railway corridor.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the Final EIR/EIS.

The purpose of project alternatives is to minimize or avoid impacts. For the Fresno to Bakersfield Section of the HST System, the alternatives were developed to reduce or avoid the impacts associated with the BNSF Alternative. In Bakersfield, the BNSF Alternative would displace six religious facilities, the Bakersfield High School Industrial Arts building, the Mercado Latino Tianguis, and 119 homes in the eastern portion of the

### L015-33

city. In contrast to the corresponding segment of the BNSF Alternative, the Bakersfield South Alternative would not affect the Bakersfield High School campus or the Mercado Latino Tianguis. However, the alignment would displace five religious facilities, the Bethel Christian School, and 146 homes in east Bakersfield. The Bakersfield Hybrid Alternative would not affect the Bakersfield High School campus or the Bethel Christian School; however, the alignment would displace one religious facility, the Mercado Latino Tianguis, the Bakersfield Homeless Shelter, and 57 homes in east Bakersfield.

### L015-34

Refer to Standard Response FB-Response-GENERAL-02.

### L015-35

Refer to Standard Response FB-Response-SO-07, FB-Response-GENERAL-27.

The Environmental Justice (EJ) Guidance is a supplement to the Authority's Title VI Program. The Authority vetted the proposed EJ Policy and Guidance with the Federal Railroad Administration (FRA). The Authority has subsequently received FRA comment to include the DOT order, which has been incorporated in the EJ Guidance document. The adoption of the EJ Policy formalized the Authority's long standing efforts to address EJ matters in a comprehensive manner. The Authority and FRA have undertaken substantial outreach to EJ communities and address EJ issues in Section 3.12 of the EIR/EIS.

The Caltrans Right of Way Manual has been developed over decades of experience in addressing the issues of fair treatment of landowners during the process of acquiring right-of-way for linear facilities throughout California (Caltrans 2009a). This manual includes Title VI provisions. The characterization of its use by the Authority as an "afterthought," as suggested by this comment, is incorrect. It is an example of the efficiency of the Authority in adopting applicable policies and procedures that have been developed and proven by another state agency over years of experience.

### L015-36

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-SO-07.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-36**

The Authority and FRA have undertaken substantial outreach to Environmental Justice communities. Materials translated into Spanish included the Executive Summary, Notice of Preparation, a summary of the highlights of the Draft EIR/EIS, an overview brochure of the Draft EIR/EIS, and comment cards at the public workshops and hearings. Also, a multi-lingual toll-free hotline was made available for public comments and requests. In addition, in an effort to address concerns about information being available, text has been added to Section 3.12, Socioeconomics, Communities, and Environmental Justice, to describe the project benefits, regional and localized effects, and project impacts. Mitigation measures are intended to reduce impacts on Environmental Justice communities through additional design modifications to reduce visual impacts. Additional outreach will also take place. These measures augment, but do not replace, the outreach undertaken before and during the review period for the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS.

### **L015-37**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-SO-07.

The Authority and FRA have undertaken substantial outreach to Environmental Justice communities. Materials translated into Spanish included the Executive Summary, Notice of Preparation, a summary of the highlights of the Draft EIR/EIS, an overview brochure of the Draft EIR/EIS, and comment cards at the public workshops and hearings. Also, a multi-lingual toll-free hotline was made available for public comments and requests. In addition, in an effort to address concerns about information being available, text has been added to Section 3.12, Socioeconomics, Communities, and Environmental Justice, to describe the project benefits, regional and localized effects, and project impacts. Mitigation measures are intended to reduce impacts on Environmental Justice communities through additional design modifications to reduce visual impacts. Additional outreach will also take place. These measures augment, but do not replace, the outreach undertaken before and during the review period for the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS.

### **L015-38**

The public outreach process for the Fresno to Bakersfield Section of the HST System has been extensive. This process has included public meetings and briefings where public comments have been received, participation in community events where participation has been solicited, and the development and distribution of educational materials to encourage feedback. These efforts are cited in Chapter 7 of the Revised DEIR/Supplemental DEIS. Public notification regarding the draft environmental documents took place in the following ways. A notification letter, informational brochure, and NOA were developed in English and Spanish and sent to landowners and tenants within 300 feet of all proposed alignment alternatives. The letters notified landowners and tenants that their property could become necessary for construction (within the project construction footprint) of one or more of the proposed alignment alternatives or project components being evaluated. Anyone who has requested to be notified or is in our stakeholder database was sent notification materials in English and Spanish. An e-mail communication concerning the notification materials was distributed to the entire stakeholder database. Public notices were placed in both English- and Spanish-language newspapers. Posters in English and Spanish were posted along the project right-of-way.

### **L015-39**

Refer to Standard Response FB-Response-GENERAL-07.

### **L015-40**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-SO-07.

The Authority and FRA have undertaken substantial outreach to Environmental Justice communities. Materials translated into Spanish included the Executive Summary, Notice of Preparation, a summary of the highlights of the Draft EIR/EIS, an overview brochure of the Draft EIR/EIS, and comment cards at the public workshops and hearings. Also, a multi-lingual, toll-free hotline was made available for public comments and requests.

### **L015-41**

Refer to Standard Response FB-Response-GENERAL-07, FB-Response-GENERAL-16, FB-Response-SO-07.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-42**

Refer to Standard Response FB-Response-GENERAL-07.

### **L015-43**

The Authority and FRA have exceeded the legal requirements of NEPA and Executive Order 12898 in obtaining public and local authority input on the project, identifying Environmental Justice communities potentially affected by the project, and informing them about and involving them in the project process.

### **L015-44**

The Authority and FRA have conducted the scoping and planning process for this project in accordance with NEPA rules and regulations. The Save Bakersfield Committee has provided no substantive evidence that this has not been the case.

### **L015-45**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-15.

The President's Council on Environmental Quality (CEQ), as part of its oversight of implementation of the National Environmental Policy Act (NEPA), held meetings in the ten federal regions with federal, state, and local officials to discuss administration of the implementing regulations in Title 40 Code of Federal Regulations (CFR) Sections 1500-1508. The 40 most-asked questions were compiled in a memorandum to agencies for the information of relevant officials and published in the Federal Register (FR) at 46 FR 18026 (1981). The response to question 4b of this memorandum addresses this comment with regard to the agency's preferred alternative, or the "proposed project" under the California Environmental Quality Act (CEQA).

"Section 1502.14(e) [40 CFR 1502.14(e)] requires the section of the EIS on alternatives to "identify the agency's preferred alternative if one or more exists, in the draft statement, and identify such alternative in the final statement . . ." This requirement means that if the agency has a preferred alternative at the Draft EIS stage, that alternative must be labeled or identified as such in the Draft EIS. If the responsible federal official in fact has no preferred alternative at the Draft EIS stage, a preferred alternative need not be identified there. By the time the Final EIS is filed, Section

### **L015-45**

1502.14(e) presumes the existence of a preferred alternative and requires its identification in the Final EIS "unless another law prohibits the expression of such a preference." (<http://ceq.hss.doe.gov/nepa/regs/40/1-10.HTM#4> [CEQ n.d.]).

Neither the Authority nor FRA had selected a "proposed project" under CEQA or a "preferred alternative" under NEPA at the time the Draft EIR/EIS was circulated or at the time the Revised DEIR/Supplemental DEIS was circulated. As required by NEPA, all alternatives carried through the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS were described in sufficient detail to evaluate the potential impacts of each alternative.

Section 15222 of the CEQA Guidelines encourages state agencies to prepare joint CEQA and NEPA documents where projects will be carried out, financed, or approved in whole or in part by federal agencies, which is the case with the proposed HST System. Joint EIR/EISs follow the NEPA approach to evaluating alternatives because this approach is more robust than the CEQA consideration of alternatives. Under NEPA (40 CFR 1505.1[e]), an EIS must include all reasonable alternatives, which must be rigorously explored and objectively evaluated as well as those other alternatives that are eliminated from detailed study with a brief discussion of the reasons for eliminating them. The CEQA Guidelines envision that the evaluation of a "proposed project" and alternatives need only be evaluated to the extent that the alternatives reduce the significant impacts of the proposed project and to foster informed decision making and public participation.

The disclaimer "Preliminary Draft/Subject to Change—HST Alignment is Not Determined" indicates that the alignment for the Fresno to Bakersfield Section had not been selected at the time the Draft EIR/EIS and Revised DEIR/Supplemental DEIS were circulated for public review.

All critical studies for the evaluation of impacts and all significant impacts have been studied for all project alternatives.

### **L015-46**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-10,

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-46

FB-Response-GENERAL-01.

The project EIR/EIS for the Fresno to Bakersfield Section is tiered from the Statewide Program EIR/EIS for the California HST System (Authority and FRA 2005). The Statewide Program EIR/EIS considered alternatives on Interstate 5 (I-5) and State Route (SR) 99 as well as on the BNSF corridor. The Record of Decision for the Statewide Program EIR/EIS selected the BNSF corridor as the preferred alignment for the Fresno to Bakersfield Section. The I-5 and SR 99 corridors were again considered during the environmental review of the Fresno to Bakersfield Section and were eliminated for further consideration, as described in FB-Response-GENERAL-02.

The concept of linking the I-5 corridor to Fresno and Bakersfield with spur lines was considered at the program level, but dismissed because it would add considerably to the I-5 corridor capital costs and would still have the same lower ridership figures. Use of the I-5 corridor would also encourage sprawl development, which is the opposite of what the HST System is intended to achieve and which was opposed by numerous agencies, including the U.S. Environmental Protection Agency (EPA). Please refer to Section 2.3, Potential Alternatives Considered during Alternatives Screening Process, and Section 2.4, Alignment, Station, and Heavy Maintenance Facility Alternatives Evaluated, in this Final EIR/EIS for the Fresno to Bakersfield Section for more detail.

Because the Authority conducted analysis of alternative alignments that follow SR 99/Union Pacific Railroad (UPRR) corridor and the I-5 corridor and determined that these alternatives were not practicable, they were not carried forward in the EIR/EIS. Neither the California Environmental Quality Act (CEQA) nor the National Environmental Policy Act (NEPA) requires the environmental document to analyze alternatives that are not practicable to implement.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF corridor.

Chapter 2, Alternatives, of the Fresno to Bakersfield Section EIR/EIS accurately states that the City of Bakersfield and Kern Council of Governments reviewed issues concerning the siting of the Metropolitan Bakersfield High-Speed Rail Terminal for over

### L015-46

6 years, participated in a regional steering committee created by the Kern Council of Governments, and retained a consultant team to analyze three potential sites in the Bakersfield metropolitan area. After careful consideration, the Council of the City of Bakersfield issued Resolution No. 118-03 on July 9, 2003, endorsing the downtown Truxtun Avenue site for the high-speed rail terminal.

The station locations are designed primarily to tie into the existing transportation network. City centers are where existing transit facilities are and typically have good connections to the existing highway system. The Authority has not ignored the City of Bakersfield's concerns and suggestions. Input from the City of Bakersfield has been taken into consideration in project planning since the project was initiated. The Bakersfield Station was located in Downtown Bakersfield adjacent to the Amtrak station at the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments. The Revised DEIR/Supplemental DEIS was modified to include information provided by the City of Bakersfield.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The Authority introduced an additional alternative through the Bakersfield area based on substantive comments received during the public and agency review of the Draft EIR/EIS. The Bakersfield Hybrid Alternative would require reduced speeds and would impact the overall travel times mandated by the California State Legislature. However, this alternative would provide the advantage of avoiding the Bakersfield High School campus and would reduce the number of religious facilities and homes impacted in east Bakersfield. Please refer to Section 3.12, Socioeconomics, Communities, and Environmental Justice, of the Final EIR/EIS for more detail.

The purpose of project alternatives is to minimize or avoid impacts. For the Fresno to Bakersfield Section of the HST System, alternatives were developed to reduce or avoid

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-46**

the impacts associated with the BNSF Alternative. In Bakersfield, the BNSF Alternative would displace six religious facilities, the Bakersfield High School Industrial Arts Building, the Mercado Latino Tianguis, and 119 homes in the eastern portion of the city. In contrast to the corresponding segment of the BNSF Alternative, the Bakersfield South Alternative would not affect the Bakersfield High School campus or the Mercado Latino Tianguis. However, this alternative would displace five religious facilities, the Bethel Christian School, and 146 homes in east Bakersfield. The Bakersfield Hybrid Alternative would not affect the Bakersfield High School campus or the Bethel Christian School. However, this alternative would displace one religious facility, the Mercado Latino Tianguis, the Bakersfield Homeless Shelter, and 57 homes in east Bakersfield.

The procedural requirements for NEPA and CEQA were followed during the environmental review of the Fresno to Bakersfield Section of the HST System.

### **L015-47**

The purpose of CEQA and NEPA is to inform decision-makers and the public of the environmental impacts of project alternatives. Impacts in and of themselves are not regulated by CEQA or NEPA.

The Authority has not ignored the City of Bakersfield's concerns and suggestions. Input from the City of Bakersfield has been taken into consideration in project planning since the project was initiated. The Bakersfield Station was located in Downtown Bakersfield adjacent to the Amtrak station at the recommendation of the City of Bakersfield, Kern County, and the Kern Council of Governments.

The Revised DEIR/Supplemental DEIS was modified to include information provided by the City of Bakersfield. Responses to all of the City of Bakersfield's comments on the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS are included in the Final EIR/EIS in Volumes IV and V, respectively.

### **L015-48**

Specific policies of the Kern County General Plan and the Bakersfield Metropolitan General Plan are listed and discussed in Appendix 3.13-A, which is part of the Revised DEIR/Supplemental DEIS.

### **L015-49**

The purpose of an EIR under CEQA and an EIS under NEPA is to disclose the environmental impacts of the proposed project, identify alternatives and mitigation measures to reduce significant impacts, and to state which impacts cannot be fully mitigated to less than significant. As stated in Chapter 3 of the Revised DEIR/Supplemental DEIS, there will be significant construction and operation impacts from the proposed project on residents of Bakersfield and surrounding communities. Most of the impacts can be reduced to a less-than-significant level with implementation of mitigation measures. Some impacts will remain significant even with implementation of mitigation measures. Table S-3 of the Revised DEIR/Supplemental DEIS provides a summary of the impacts, mitigation measures, and CEQA level of significance after mitigation.

### **L015-50**

Operational emissions from station operations (including employee, truck delivery, and passenger travel to the stations) were addressed in Section 3.3.6 of the Final EIR/EIS (see Tables 3.3-11 and 3.3-12). Specific sources that were included in station operational emissions are discussed in the Air Quality Technical Report (Section 6.2) (Authority and FRA 2012f).

### **L015-51**

As stated in Section 3.2.3.3, Operational/Project Impacts, the forecasted daily trips to/from each of the stations were distributed on the transportation network based on the results of the travel demand model and on access to and from the proposed station areas. As with the existing-conditions analysis, the Synchro software was used to define the future traffic operating conditions on study area roads and intersections for level of service and delay for the 2035 No Project and 2035 Plus Project conditions. The results provided the change (or no change) in operating conditions (both as compared to existing conditions and as compared to 2035 No Project conditions) used to determine the severity of the project impact.

### **L015-52**

The EIR/EIS for the Fresno to Bakersfield Section covers the area from the Fresno Station alternatives to the Bakersfield Station alternatives. These two stations are the

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-52

logical termini for the project. The selection of a Bakersfield Station alternative will determine the location of the HST alignment east of the station to Oswald Street, where all of the alternative alignments through Bakersfield converge. Although the area east of the Bakersfield Station is outside the project limits, the environmental evaluation of alignment alternatives east to Oswald Street was necessary to inform decision-makers and the public of the complete environmental implications of the decision on the location of the Bakersfield Station. Because all of the alternatives through Bakersfield converge at Oswald Street, evaluation of impacts caused by the project farther east of Oswald Street does not inform the decision on the location of the Bakersfield Station, the southern terminus of the project.

### L015-53

Refer to Standard Response FB-Response-SO-01.

Please refer to EIR/EIS Mitigation Measure SO-4: Implement measures to reduce impacts associated with the relocation of important facilities. These measures will apply to schools, churches, city and county property, as well as other important facilities. The Authority will consult with these respective parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and also to ensure relocation that allows the community currently served to continue to access these services. This mitigation measure will be effective in minimizing the impacts of the project by completing new facilities before the necessary relocations, and by involving affected facilities in the process of identifying new locations for their operations.

The Authority, as required under the Uniform Act and CRAA, bears the cost of compensation for displaced public infrastructure. The exact dollar value for each will be determined through an appraisal of the property during the property acquisition and compensation process. While it is not possible to know what local jurisdictions spent on the infrastructure that will need to be relocated or replaced, the cost of relocation and replacement has been estimated and is included in the overall cost of the project. Funding secured for the HST project includes the total amount required for all of the land acquisition and compensation.

### L015-54

There are some known conflicts with the high-speed train alignment options and the Thomas Road Improvement Program projects, including the Centennial Corridor project options. Only one option for each project would ultimately be constructed; therefore, developing a project alternative that avoids all possible corridor options would misrepresent the height, impact, and cost of the high-speed rail project. The coordination with the projects is ongoing and will continue as the designs progress concurrently.

### L015-55

Refer to Standard Response FB-Response-SO-01.

Please refer to EIR/EIS Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities. These measures will apply to all schools, churches, city and county property, as well as other important facilities displaced in Bakersfield. The Authority will consult with these respective parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and to ensure relocation that allows the community currently served to continue to access these services. This mitigation measure will be effective in minimizing the impacts of the project by completing new facilities before necessary relocations, and by involving affected facilities in the process of identifying new locations for their operations. The Authority, as required under the Uniform Act and CRAA, bears the cost of compensation for displaced public infrastructure.

### L015-56

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05, FB-Response-AVR-04, FB-Response-GENERAL-02.

Viaduct Impacts to Bakersfield (1): A comparison between the effects of the proposed project and an undefined alternative is not feasible. Elevated segments of the HST project can potentially have adverse visual impacts over a greater distance than at-grade segments, but with landscape screening or other mitigation measures, such adverse visual impacts are not necessarily always the case.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-57**

The Authority released the Revised DEIR/Supplemental DEIS in July 2012; the revised document contained new alternatives in the vicinity of Hanford and Bakersfield that were created specifically to avoid impacts that were identified in the Draft EIR/EIS.

### **L015-58**

Volume III of the EIR/EIS provides engineering drawings that illustrate the elevation of the viaduct through Bakersfield. These elevation profiles are keyed to the alignment plans so individuals can determine the elevation of the viaduct at any location along the alignment and understand how the project will look at specific locations.

### **L015-59**

Refer to Standard Response FB-Response-SO-05, FB-Response-SO-02.

The analysis in EIR/EIS Volume I Section 3.12 Impact SO#3, Impact SO#4, and Impact SO #12 examined the HST construction and operation-related property and sales tax revenue effects. This analysis evaluated potential effects based on existing conditions, as required under CEQA, and does not include a speculative analysis or mitigation for unproven future loss of revenue from future property values. The analysis in Section 3.12 describes how a short-term reduction in property tax revenues may occur due to property acquisition by removing parcels from county tax rolls. This estimated amount ranges from a low of 0.03% of the total fiscal year 2009-2010 property-tax revenue of Tulare County to a high of 0.2% in Kings County. Therefore, the intensity is negligible for all alternatives, because the economic impact is measurable, but would not be perceptible to community residents. Some short-term reductions in sales tax revenues are expected because the need to acquire land will necessitate the relocation of businesses along the project alignment. Although relocations in the same vicinity would limit losses in sales tax revenues for local jurisdictions, the potential for temporary sales tax loss would remain, either because businesses would temporarily close during these relocations or because some might choose to close down rather than relocate. The expected annual gain in sales tax revenue from project spending is greater than the expected loss from business relocation. The project would generate an estimated \$1.5 million annually in direct new sales tax revenues for the region through project spending on operation and maintenance.

### **L015-59**

The literature review presented in the Community Impact Assessment Technical Report (Authority and FRA 2012h) of research studies, was conducted on the effect of constructing new commuter rail lines on residential and commercial real estate values. The research was conducted on the property value impacts of different types of rail transit (including elevated, at-grade, and below-grade structures). The majority of the studies found that rail transit access had a positive influence on residential property values, due to a presumed relationship between property values and improved accessibility (both of residents to regional jobs and of employers to a larger labor pool). In a study of the property value impacts associated with a variety of disamenities, such as environmental contamination or proximity to linear features like roadways and railroads, Simons (Simons 2006) reviewed several rigorous studies (conducted in Ohio, Georgia, and Norway) of the relationship between residential property values and proximity to rail lines, and concluded that there were negative property value impacts in the single digits (e.g., 2 or 3%) for residential properties within 750 feet of an active railroad track (this study made no differentiation for elevated or at-grade structures).

### **L015-60**

Refer to Standard Response FB-Response-GENERAL-05, FB-Response-GENERAL-10, FB-Response-GENERAL-14, FB-Response-SO-04.

### **L015-61**

Please see Appendix A of the Community Impact Assessment Technical Report (Authority and FRA 2012h) for a complete description of the methodologies used for property displacement analysis. To be conservative in this analysis and avoid underestimating displacements, it was assumed that in cases where residences and businesses were located on acquired parcels, including those under viaducts, these properties were counted as permanent displacements. This was done because in most cases, no properties will remain underneath elevated structures. Only compatible land use, as determined first by FRA and Department of Homeland Security and then as approved by the local jurisdiction's land use plan, would be placed under the elevated guideway in the future.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

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### **L015-62**

Refer to Standard Response FB-Response-N&V-05, FB-Response-AVR-03.

Sections 3.16.7.1 and 3.16.7.2 of the Revised DEIR/Supplemental DEIS list the mitigation measures that would be applied to reduce impacts on views of the alignments.

### **L015-63**

Refer to Standard Response FB-Response-N&V-05, FB-Response-SO-01.

### **L015-64**

The elevated track portion of the HST includes a walking surface and a lateral safety railing, in accordance with standard engineering design requirements (NFPA International 2001). The design also would include ground access from the elevated tracks at regular intervals along the elevated structure, allowing for emergency passenger evacuation if needed, as well as for routine track maintenance. As discussed in Section 3.11.6 of the EIR/EIS, the emergency response along elevated tracks would be conducted swiftly and efficiently.

### **L015-65**

Refer to Standard Response FB-Response-SO-02, FB-Response-GENERAL-21, FB-Response-GENERAL-14, FB-Response-SO-03, FB-Response-SO-04, FB-Response-SO-05.

See EIR/EIS Volume I Section 3.12 Impact SO #9 for residential displacements. All final determinations on property acquisition would occur during the acquisition process, see Volume II Technical Appendix 3.12-A for details. Please see Appendix A of the Community Impact Assessment Technical Report (Authority and FRA 2012h) for a complete description of the methodologies used for property displacement analysis.

To be conservative in this analysis and avoid underestimating displacements, it was assumed that in cases where residences and businesses were located on acquired parcels, including those only temporarily affected, these properties were counted as permanent displacements. This was done because it is not possible at this stage of the

### **L015-65**

project to predict the outcome of the parcel-by-parcel property acquisition phase. These conservative displacement numbers were then used in all community division, fiscal revenue and physical deterioration analysis, and therefore do not underestimate the potential impacts.

For information on potential HST project impacts on property values see Section 5.4.4.3 in the Community Impact Assessment Technical Report (Authority and FRA 2012h). For information on the HST operation-related property and sales tax revenue effects see EIR/EIS Volume I Section 3.12 Impact SO#3, Impact SO#4, and Impact SO #12. Details on the business analysis, including type of businesses affected, vacancies, and number of employees potentially affected are included in Section 5.2.3 of the Community Impact Assessment Technical Report. See Section 5.1.2 in the Community Impact Assessment Technical Report and EIR/EIS Volume I Section 3.12 Impacts SO#5 and SO#13 for information on project job creation during construction and operation.

### **L015-66**

Refer to Standard Response FB-Response-GENERAL-02.

### **L015-67**

Refer to Standard Response FB-Response-GENERAL-02.

As described in Section 1.5, Tiering of Program EIR/EIS Documents, of the Final EIR/EIS of the Fresno to Bakersfield Section, in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA 2005), the Authority and FRA selected the BNSF Railway route as the preferred alternative for the HST System between Fresno and Bakersfield. Therefore, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF Railway corridor.

### **L015-68**

Refer to Standard Response FB-Response-GENERAL-12, FB-Response-GENERAL-13.

### **L015-69**

Refer to Standard Response FB-Response-PU&E-02.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-69

Construction emissions can be found in Section 7.10 of the Fresno to Bakersfield Air Quality Technical Report (Authority and FRA 2012f). Operational emissions can be found in Section 7.1. The methodologies and calculations are described in detail, with additional details of the specific values used included in the appendices. In Section 3.3.6.3, Impact AQ #10, station emissions were estimated for employee and passenger traffic. The methodology and detailed emission air quality estimates are also available in the Fresno to Bakersfield Air Quality Technical Report (Authority and FRA 2012f).

The analysis in the Air Quality, Section 3.3 of the Final EIR/EIS fully describes the methodologies used and significance criteria used in reaching the conclusions of the air quality impacts listed in Section 3.3.6.3, Mitigation Measure AQ-4: Offset Project Construction Emissions through an SJVAPCD VERA. This measure provides for the Authority and San Joaquin Valley Air Pollution Control District to enter into a contractual agreement to mitigate, through offsetting to net zero, the project's actual emissions with funds provided for the district's Emission Reduction Incentive Program at the beginning of the construction phase. Therefore, mitigation/offsets will occur in the year of impact, or as otherwise permitted by 40 CFR Part 93 Section 93.163. There will be no long-term delay in achieving the net-zero emission reductions through the construction offset agreement.

As described in Section 3.3.6.3, as well as in Tables 3.3-9 and 3.3-10 of the Revised DEIR/Supplemental DEIS, the power plant emissions were estimated for the entire host project at a statewide level. The HST system would be electrically powered. While cars and planes result in direct air and greenhouse gas (GHG) emissions from fossil fuel combustion, the HST only results in indirect air and GHG emissions due to the power plants that produce electricity. Indirect fossil fuel combustion emissions from power plants that provide the electricity for the HST are provided in Tables 3.3-9 and 3.3-10 in the Revised DEIR/Supplemental DEIS. In addition, because of the state requirement that an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio must come from renewable energy sources, the emissions generated for the HST system are expected to be lower in the future when compared to emissions estimated in Tables 3.3-9 and 3.3-10 in the Revised DEIR/Supplemental DEIS, which are based on the state's current power portfolio.

### L015-70

Refer to Standard Response FB-Response-TR-01.

Construction trip lengths were used to address impacts, primarily for air quality. An average length of construction trip distance was used for each alternative except for the Wasco-Shafter Bypass, which is about 5% shorter in total length of the segment that would be constructed. Construction impacts of the HMF facilities also included the length of trips, although these are a small percentage of the overall construction impacts.

The common construction impacts resulting from all HST alternatives are temporary impacts on local circulation and emergency access, which are organized by the location in which they occur, as follows:

- Urban areas where stations and some mainline construction would occur.
- HMF alternatives.
- Areas adjacent to freeways and/or existing rail lines where existing overcrossings would be modified or relocated, and in some instances, where the freeway would be relocated.
- Rural areas where mainline roadbed and minor road overcrossings would be built.
- Rural areas where transmission lines would be constructed, improved, or reconducted (new conductors installed).

Because construction impacts would be temporary (primarily related to temporary road closures, detours, and safety access), these impacts are considered against existing conditions. Each of the build alternatives involve similar construction equipment and length of construction. The Authority and FRA have considered avoidance and minimization measures consistent with the Statewide and Bay Area to Central Valley Program EIR/EIS commitments. During project design and construction, the Authority and FRA would implement measures to reduce impacts on circulation.

On roadways, impacts from each individual road closure would be an inconvenience, but would not restrict continued access, and therefore impacts were determined to be less than significant (LTS). Since the LTS impact is associated with each specific road closure, there is no overall difference between 15 or 20 road closures, as the comments suggests.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-70**

Protection of roads during construction is specifically addressed in Section 3.2.6, Project Design Features, bullet #6 Protection of Public Roads During Construction, and Impact TR #1 - Construction (Not Including Stations) Impacts on Circulation and Emergency Access.

### **L015-71**

Refer to Standard Response FB-Response-N&V-03, FB-Response-N&V-05.

- 1) The Authority released a Revised DEIR/Supplemental DEIS in July 2012 that contained new alternatives in the vicinity of Hanford and Bakersfield that were created specifically to avoid impacts that were identified in the Draft EIR/EIS.
- 2) Refer to Standard Response FB-Response-N&V-03 and FB-Response-N&V-05.
- 3) Refer to Standard Response FB-Response-N&V-05.
- 4) Refer to Standard Response FB-Response-N&V-05.
- 5) The California High Speed Rail Authority is responsible for determining this.
- 6) The California High Speed Rail Authority is responsible for determining this.
- 7) Volume III depicts the potential extents of the sound barriers on plan. This is shown as a line with intermittent circles as identified in the legend on page 10 of 16 in the Volume III General Sheets. The cross sections do not show the potential sound barriers, as the position, height, and design of this mitigation must be completed by the design-build contractor.
- 8) Aerodynamic noise was taken into account in the noise model. The potential noise impact has been assessed at sensitive receivers, and these areas are identified in Section 3.4.7, Environmental Consequences, of the Revised DEIR/Supplemental DEIS and shown on Figures 3.4-9 through 3.4-13. The locations of potential barriers are illustrated on Figures 3.4-15 through 3.4-19. Refer to Section 3.4.6 for a complete listing of noise impact mitigation measures that would reduce noise impacts below a "severe" level. The Proposed California High-Speed Train Project Noise and Vibration Mitigation Guidelines developed by the Authority (see Appendix 3.4-A of the Revised DEIR/Supplemental DEIS) were used to determine whether mitigation would be proposed for these areas of potential impact. The Guidelines require consideration of feasible and effective mitigation for severe noise impacts (impacts where a significant percentage of people would be highly annoyed by the HST project's noise).

### **L015-71**

The Authority will refine mitigation for homes with residual severe noise impacts (i.e., severe impacts that remain notwithstanding noise barriers) and address them on a case-by-case basis during final design of the Preferred Alternative. In addition to the potential use of noise barriers, other forms of noise mitigation may include improvements to the home itself that will reduce the levels by at least 5 dBA, such as adding acoustically treated windows, extra insulation, and mechanical ventilation, as detailed in Section 3.4.6, Project.

The Revised DEIR/Supplemental DEIS proposes noise barriers in areas of severe noise impacts resulting from the project, where the barriers meet the cost-effectiveness criteria. To meet the cost-effectiveness criteria, barriers must mitigate noise for more than 10 sensitive receivers, be not less than 800 feet in length, be less than 14 feet in height, and cost below \$45,000 per benefited receiver. A receiver that receives at least a 5-dBA noise reduction due to the barrier is considered a benefited receiver.

Mitigation Measure N&V-MM#3 provides that sound barriers may be installed to reduce noise to acceptable levels at adjoining properties. These may include walls, berms, or a combination of walls and berms. The specific type of barrier will be selected during final design, and before operations begin. In addition, Mitigation Measure N&V-MM#3 provides that prior to operation, the Authority will work with communities regarding the height and design of sound barriers using jointly developed performance criteria, when the vertical and horizontal location have been finalized as part of the final design of the project. Mitigation Measure VQ-MM#6 requires the provision of a range of options to reduce the visual impact of the sound barriers.

9) The California High Speed Rail Authority is responsible for determining this.

10) Refer to Standard Response FB-Response-N&V-03 and FB-Response-N&V-05.

The Authority released a Revised DEIR/Supplemental DEIS in July 2012 that contained new alternatives in the vicinity of Hanford and Bakersfield that were created specifically to avoid impacts that were identified in the Draft EIR/EIS.

### **L015-72**

Refer to Standard Response FB-Response-GENERAL-01.

All of the mitigation measures presented in the EIR/EIS are within the jurisdiction of the Authority and FRA.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-72

As indicated in Section 15093 of the CEQA Guidelines, a Finding of Overriding Consideration is made before the approval of a project if the Final EIR/EIS identifies significant impacts that cannot be mitigated to a level of less than significant. The EIR/EIS does not contain a Finding of Overriding Consideration; rather, the EIR/EIS provides the information for such a finding.

### L015-73

Refer to Standard Response FB-Response-GENERAL-01.

The environmental impacts associated with the No Project Alternative projected to 2035 are provided for each environmental discipline in Chapter 3 of the EIR/EIS. The determination of the environmentally superior alternative is provided in the Final EIR/EIS.

The EIR/EIS follows the CEQA Guidelines and provides the information on project impacts and mitigation required for decision-makers and the public to determine the environmental consequences of project implementation. Findings of Overriding Consideration are not made in an environmental document. The conclusions of the environmental document are used to develop the Findings of Overriding Consideration.

The Authority and FRA have followed the procedural and substantive requirements of NEPA and CEQA. No factual information has been provided in these comments to indicate that the procedures and requirements of NEPA and CEQA were not followed in the environmental review process for the Fresno to Bakersfield Section.

An EIR project description is intended to be general, not detailed (CEQA Guidelines § 15124[c]). Final design or even advanced design of infrastructure is not required in the project description (Dry Creek Citizens Coalition v. County of Tulare [1999] 70 Cal.App.4th 20, 36). Abundant substantive evidence in the record demonstrates that the project description in the EIR/EIS is more than adequate. The term "15% design" is an engineering term of art that refers to the level of engineering prepared on HST project elements for the EIR/EIS. The 15% design generates detailed information, like the horizontal and vertical locations of track, cross sections of the infrastructure with

### L015-73

measurements, precise station footprints with site configurations, and temporary construction staging sites and facilities. The 15% design also yields a "project footprint" overlaid on parcel maps; the project footprint shows the outside envelope of all disturbance, including both permanent infrastructure and temporary construction activity. This 15% design translated into a project description in the EIR/EIS with 100% of the information that is required under CEQA Guidelines Section 1512447 (see Dry Creek, supra, 70 Cal.App.4th at pp. 27-36 [upholding EIR conceptual project description as inadequate when based on preliminary design]).

Volume IV of the Final EIR/EIS provides responses to the comments received on the Draft EIR/EIS. Volume V of the Final EIR/EIS provides responses to the comments received on the Revised DEIR/Supplemental DEIS. All significant environmental issues raised on the project have been evaluated and are contained in the EIR/EIS.

A number of questions in this comment ask if impacts caused by project alternatives violate CEQA. The purpose of an EIR is to analyze and document the environmental impacts of a project. The fact that a project alternative will result in environmental impacts is not a violation of CEQA.

The EIR/EIS is written in plain language with appropriate graphics.

### L015-74

The Revised DEIR/Supplemental DEIS for the Fresno to Bakersfield Section meets the statutory requirements of assembly Bill (AB) 3034. No substantive evidence has been provided in this submission that the EIR/EIS does not meet those requirements.

This comment suggests that a lead agency must define its project based on available funding---in this case, the funding available for the Initial Construction Segment. The California Environmental Quality Act (CEQA) includes no such rule, and courts cannot impose procedural or substantive requirements beyond those explicitly stated in the statute or Guidelines (Pub. Res. Code § 21083.1). Such a rule would force lead agencies to re-define their projects every time funding changes, a result that would be in direct conflict with the "rule of reason" that governs EIRs (*Laurel Heights Improvement Assn. v. UC Regents* [1988] 47 Cal.1.3d 376, 406-407).

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-74

The Statewide Program EIR/EIS for the California HST System (Authority and FRA 2005) addressed alternative HST technologies, including Maglev. Maglev was not selected as the preferred technology because it is not a proven, reliable technology.

The EIR/EIS for the Fresno to Bakersfield Section provides environmental analysis and mitigation measures for project-specific alternatives.

The maps provided in the EIR/EIS for the Fresno to Bakersfield Section have been designed to fit on a page so that they can be readily reviewed by the reader.

The EIR/EIS provides three alternative routes in Bakersfield to connect to a station in Downtown Bakersfield, as recommended by the City of Bakersfield, Kern County, and the Kern Council of Governments.

As discussed in Section 3.6.5, Environmental Consequences, of the Final EIR/EIS, the project would increase electricity demand. Because of the anticipated times of peak rail travel, impacts on electricity generation and transmission facilities would be particularly focused on peak electricity demand periods (4 p.m. to 6 p.m.). According to the Statewide Program EIR/EIS (Authority and FRA 2005), the HST System would increase peak electricity demand on the state's generation and transmission infrastructure by an estimated 480 MW in 2020. Assuming that this peak demand would be evenly spread throughout the HST System, the Fresno to Bakersfield Section would require approximately 78 MW of additional peak capacity.

Summer 2010 electricity reserves were estimated to be between 27,708 MW for 1-in-2 summer temperatures and 18,472 MW for 1-in-10 summer temperatures (Pryor et al. 2010). The projected peak demand of the HST System is not anticipated to exceed these existing reserve amounts. Although supplies for 2035 cannot be predicted, given the planning period available and the known demand from the project, energy providers have sufficient information to include the project in their demand forecasts. The project's effect on peak electricity demand would be less than significant.

The Statewide Program EIR/EIS (Authority and FRA 2005) provides the comparison of

### L015-74

cost for expansion of existing transportation modes. The comment provides no substantive evidence that the estimated costs of expanding existing transportation modes is overstated. Please see the Statewide Program EIR/EIS for an explanation of why the HST System was selected as the preferred transportation mode as opposed to expansion of existing modes of transportation.

### L015-75

This comment isolates a single step in the development of the HST System and claims its independent benefits are unlikely to justify the expense. As discussed in the Revised 2012 Business Plan (Authority 2012a), the California High-Speed Rail (HSR) Program will depend on a mix of public and private investment, the latter becoming available after the fundamental economics of the program are demonstrated. A phased approach to system development is the prudent course to build a foundation that allows for greater efficiency in the use of private investment once the initial segments of the system are in place.

This approach also recognizes current budgetary and funding realities. Among other things, the phased approach will help ensure the system's success by introducing Californians to HSR service and building ridership over time. At the same time, improvements can be made to regional systems that connect with HSR, resulting in the conventional and high-speed systems complementing each other.

The goals of Proposition 1A were used to develop the phasing strategy for the statewide HSR system and were guided by the following key principles:

- Divide the statewide high-speed rail program into a series of smaller, discrete projects that can stand alone, will provide viable revenue service, can be matched to available funding, and can be delivered through appropriate business models.
- Advance sections as soon as feasible to realize early benefits, especially employment, and to minimize inflation impact.
- Leverage existing rail systems and infrastructure, including connecting rail and bus services.
- Forge a long-term partnership with the federal government for program delivery.
- Develop partnerships with other transportation operators to identify efficiencies through

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-75

leveraging state, regional, local, and capital program investments and maximizing connectivity between systems.

- Seek earliest feasible and best-value private-sector participation and financing with appropriate risk transfer and cost containment.
- Mitigate against the risk of funding delays by providing decision points for state policymakers to determine how and when the next steps should proceed, while leaving a fully operational system and generating economic benefits at each step.

The Authority applied these principles, taking into account key factors such as cost, funding scenarios, and ridership and revenue projections to develop an implementation strategy with the following key steps:

**Step 1 - Early Investments, Statewide Benefits.** The first construction of dedicated high-speed infrastructure for the initial operating system (IOS) begins in the Central Valley. As with all of the steps, this initial section is being developed to deliver early benefits by leveraging other systems - enabling them to operate on the new high-speed tracks, which can be done without impacts on design or the integrity of the new infrastructure. Improved passenger rail service would begin on completion of the first IOS segment by connecting the San Joaquins, ACE, Sacramento Regional Transit, and the Capitol Corridor (and potentially Caltrain). Through a new, strategic approach, there is also the opportunity for new or improved travel between Bakersfield and Sacramento, Oakland, San Jose, and San Francisco. This expanded Northern California Unified Service could begin operation as early as 2018, with the potential to provide transportation and economic benefits well before fully operational high-speed rail service is initiated.

As part of this first step, complementary investments and improvements will be made to both accelerate benefits and distribute them more widely across the state. These investments will be made using the \$950 million in Proposition 1A connectivity funding, available Proposition 1A high-speed rail funds, future federal funds, and other sources, and will include the following:

- Investment in the bookends: In Northern California, the long-awaited electrification of the Caltrain corridor will begin under a collaborative program between Bay Area agencies and the Authority. In addition, consistent with the Southern California MOU, investments will be made in key rail corridors in the southern part of the state, such as upgrading the Metrolink corridor from Los Angeles to Palmdale.

### L015-75

- The Northern California Unified Service described above will be initiated.
- As the next step in the IOS, work to close the rail gap between Bakersfield and Palmdale through the Tehachapi Mountains will begin. Environmental clearance is possible in early 2014, and plans are being developed to move quickly to implement the improvements to close this critical gap and create the first statewide rail link between the Bay Area and the Los Angeles Basin.

**Step 2 - Initial High-Speed Rail Operations.** Introduction of the state's (and the nation's) first fully operational high-speed rail service will begin. This service can be operated by a private entity without subsidy, will have the potential to attract private investment to expand the system from Bay to Basin, and can be completed within a decade. The service will be blended with regional/local systems. The IOS is achieved through expansion of the first construction segment into an electrified operating high-speed rail line from Merced to Palmdale and the San Fernando Valley, accessing the populous Los Angeles Basin. Following on the work discussed above, the next priority in implementing the IOS will be closing the rail gap between Northern and Southern California by crossing the Tehachapi Mountains with new, dedicated high-speed rail infrastructure. Before completion of the IOS to the San Fernando Valley, this link will tie the north to the south at Palmdale, where Metrolink commuter rail service can then provide service and connections throughout Southern California.

Currently, the IOS is defined as extending from Merced to the San Fernando Valley, and high-speed revenue service would only start once the full IOS is built and operable. Should ridership and revenue forecasts and financial projections demonstrate that revenue service compliant with Proposition 1A could begin earlier, with a shorter IOS, appropriate reviews would occur to consider and implement earlier service, if appropriate.

**Step 3 - The Bay to Basin System.** The dedicated high-speed rail infrastructure of the IOS will be expanded north and west to San Jose, providing HSR service between the state's major population centers in the north and south and providing the platform for the transition to statewide blended operations. At this stage, passengers will be able to take a one-seat ride between greater Los Angeles (San Fernando Station) and the San Francisco Transbay Transit Center using blended infrastructure in the north between San Francisco and San Jose (assuming electrification of the Caltrain corridor by 2020 as proposed by Caltrain), using dedicated high-speed rail infrastructure between San Jose and the San Fernando Station, and, in the south, connecting via Metrolink between the

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-75

San Fernando Valley Station and the Los Angeles Union Station and on to other points throughout Southern California.

**Step 4 - The Phase 1 System.** For the blended approach, the dedicated high-speed rail infrastructure of the Bay to Basin system will be extended from the San Fernando Valley to Los Angeles Union Station, linking to a significantly upgraded passenger rail corridor developed to maximize service between Los Angeles and Anaheim while also addressing community concerns about new infrastructure impacts in a congested urban corridor that includes a number of established communities that abut the existing right-of-way. Under a Full Build scenario, dedicated high-speed rail infrastructure would be extended from San Jose to San Francisco's Transbay Transit Center and from Los Angeles to Anaheim.

**Step 5 - The Phase 2 System.** Phase 2 will extend the high-speed rail system to Sacramento and San Diego, representing completion of the 800-mile statewide system. Travelers will be able to travel between all of the state's major population centers on high-speed rail. Phase 2 areas will see improvements in rail service well in advance of the expansion of the high-speed rail system through the combination of early investments and blended operations, as described in this Revised Plan.

### L015-76

The proposed project is part of a statewide project to provide a needed alternative transportation mode for intercity travel in the state of California. Representatives of the City of Bakersfield and Kern County have been involved in project planning for over a decade and the City, County, and Kern Council of Governments have previously endorsed the project with a downtown station in the vicinity of the Amtrak station. The state cannot stop projects designed for the benefit of the people of the state as a whole because of changing political opinion in an individual community.

### L015-77

A number of these questions imply that the Authority must define its project based on available funding. CEQA and NEPA have no such requirement. Such a requirement would force lead agencies to re-define their projects every time funding changes, which would be in direct conflict with the "rule of reason" that governs EIRs (Laurel Heights Improvement Assn. v. UC Regents [1988] 47 Ca1.3d 376, 406-407).

### L015-77

Many of these questions assume the project will halt after construction of the ICS. There is no factual basis for this assumption.

As discussed in the Revised 2012 Business Plan (Authority 2012a), the California High-Speed Rail (HSR) Program will depend on a mix of public and private investment, the latter becoming available after the fundamental economics of the program are demonstrated. A phased approach to system development is the prudent course to build a foundation that allows for greater efficiency in the use of private investment once the initial segments of the system are in place.

This approach also recognizes current budgetary and funding realities. Among other things, the phased approach will help ensure the system's success by introducing Californians to HSR service and building ridership over time. At the same time, improvements can be made to regional systems that connect with HSR, resulting in the conventional and high-speed systems complementing each other.

The goals of Proposition 1A were used to develop the phasing strategy for the statewide HSR system and were guided by the following key principles:

- Divide the statewide high-speed rail program into a series of smaller, discrete projects that can stand alone, will provide viable revenue service, can be matched to available funding, and can be delivered through appropriate business models.
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- Forge a long-term partnership with the federal government for program delivery.
- Develop partnerships with other transportation operators to identify efficiencies through leveraging state, regional, local, and capital program investments and maximizing connectivity between systems.
- Seek earliest feasible and best-value private-sector participation and financing with appropriate risk transfer and cost containment.
- Mitigate against the risk of funding delays by providing decision points for state policymakers to determine how and when the next steps should proceed, while leaving

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-77

a fully operational system and generating economic benefits at each step.

The Authority applied these principles, taking into account key factors such as cost, funding scenarios, and ridership and revenue projections to develop an implementation strategy with the following key steps:

**Step 1—Early Investments, Statewide Benefits.** The first construction of dedicated high-speed infrastructure for the initial operating system (IOS) begins in the Central Valley. As with all of the steps, this initial section is being developed to deliver early benefits by leveraging other systems—enabling them to operate on the new high-speed tracks, which can be done without impacts on design or the integrity of the new infrastructure. Improved passenger rail service would begin on completion of the first IOS segment by connecting the San Joaquins, ACE, Sacramento Regional Transit, and the Capitol Corridor (and potentially Caltrain). Through a new, strategic approach, there is also the opportunity for new or improved travel between Bakersfield and Sacramento, Oakland, San Jose, and San Francisco. This expanded Northern California Unified Service could begin operation as early as 2018, with the potential to provide transportation and economic benefits well before fully operational high-speed rail service is initiated.

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- The Northern California Unified Service described above will be initiated.
- As the next step in the IOS, work to close the rail gap between Bakersfield and Palmdale through the Tehachapi Mountains will begin. Environmental clearance is possible in early 2014, and plans are being developed to move quickly to implement the improvements to close this critical gap and create the first statewide rail link between the Bay Area and the Los Angeles Basin.

### L015-77

**Step 2—Initial High-Speed Rail Operations.** Introduction of the state's (and the nation's) first fully operational high-speed rail service will begin. This service can be operated by a private entity without subsidy, will have the potential to attract private investment to expand the system from Bay to Basin, and can be completed within a decade. The service will be blended with regional/local systems. The IOS is achieved through expansion of the first construction segment into an electrified operating high-speed rail line from Merced to Palmdale and the San Fernando Valley, accessing the populous Los Angeles Basin. Following on the work discussed above, the next priority in implementing the IOS will be closing the rail gap between Northern and Southern California by crossing the Tehachapi Mountains with new, dedicated high-speed rail infrastructure. Before completion of the IOS to the San Fernando Valley, this link will tie the north to the south at Palmdale, where Metrolink commuter rail service can then provide service and connections throughout Southern California.

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**Step 3—The Bay to Basin System.** The dedicated high-speed rail infrastructure of the IOS will be expanded north and west to San Jose, providing HSR service between the state's major population centers in the north and south and providing the platform for the transition to statewide blended operations. At this stage, passengers will be able to take a one-seat ride between greater Los Angeles (San Fernando Station) and the San Francisco Transbay Transit Center using blended infrastructure in the north between San Francisco and San Jose (assuming electrification of the Caltrain corridor by 2020 as proposed by Caltrain), using dedicated high-speed rail infrastructure between San Jose and the San Fernando Station, and, in the south, connecting via Metrolink between the San Fernando Valley Station and the Los Angeles Union Station and on to other points throughout Southern California.

**Step 4—The Phase 1 System.** For the blended approach, the dedicated high-speed rail infrastructure of the Bay to Basin system will be extended from the San Fernando Valley to Los Angeles Union Station, linking to a significantly upgraded passenger rail corridor developed to maximize service between Los Angeles and Anaheim while also

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-77

addressing community concerns about new infrastructure impacts in a congested urban corridor that includes a number of established communities that abut the existing right-of-way. Under a Full Build scenario, dedicated high-speed rail infrastructure would be extended from San Jose to San Francisco's Transbay Transit Center and from Los Angeles to Anaheim.

**Step 5—The Phase 2 System.** Phase 2 will extend the high-speed rail system to Sacramento and San Diego, representing completion of the 800-mile statewide system. Travelers will be able to travel between all of the state's major population centers on high-speed rail. Phase 2 areas will see improvements in rail service well in advance of the expansion of the high-speed rail system through the combination of early investments and blended operations, as described in this Revised Plan.

### L015-78

The Bakersfield Hybrid Alternative was developed partly in response to suggestions from City of Bakersfield staff.

### L015-79

Refer to Standard Response FB-Response-SO-01.

Please refer to Mitigation Measure SO-3: Implement measures to reduce impacts associated with the relocation of important facilities. These measures will apply to all schools, churches, city and county property, as well as other important facilities displaced in Bakersfield. The Authority will consult with these respective parties before land acquisition to assess potential opportunities to reconfigure land use and buildings and/or relocate affected facilities, as necessary, to minimize the disruption of facility activities and services, and also to ensure relocation that allows the community currently served to continue to access these services. This mitigation measure will be effective in minimizing the impacts of the project by completing new facilities before necessary relocations, and by involving affected facilities in the process of identifying new locations for their operations. The Authority, as required under the Uniform Act and CRAA, bears the cost of compensation for displaced public infrastructure.

### L015-80

The EIR/EIS has been prepared in accordance with the requirements of CEQA and

### L015-80

NEPA. The significant impacts of the proposed project have been identified in the EIR/EIS. The Authority has met several times with the City of Bakersfield and Kern County and has modified certain project components and identified a new alternative in response to suggestions from the City of Bakersfield's staff and to avoid impacts to some of the residences, churches, and medical facilities that would be affected by the other two Bakersfield alternatives.

### L015-81

The HST project will not preclude the Thomas Roads Improvement Program (TRIP) or any other entity from constructing planned roadway improvements or construction.

### L015-82

Refer to Standard Response FB-Response-GENERAL-17.

### L015-83

The project is not another Amtrak corridor in the San Joaquin Valley. As discussed in the Revised 2012 Business Plan (Authority 2012a), the California High-Speed Train (HST) Program will depend on a mix of public and private investment, the latter becoming available after the fundamental economics of the program are demonstrated. A phased approach to system development is the prudent course to build a foundation that allows for greater efficiency in the use of private investment once the initial segments of the system are in place.

This approach also recognizes current budgetary and funding realities. Among other things, the phased approach will help ensure the system's success by introducing Californians to HST service and building ridership over time. At the same time, improvements can be made to regional systems that connect with HST, resulting in the conventional and high-speed systems complementing each other.

The goals of Proposition 1A were used to develop the phasing strategy for the statewide HSR system and were guided by the following key principles:

- Divide the statewide high-speed rail program into a series of smaller, discrete projects

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### L015-83

that can stand alone, will provide viable revenue service, can be matched to available funding, and can be delivered through appropriate business models.

- Advance sections as soon as feasible to realize early benefits, especially employment, and to minimize inflation impact.
- Leverage existing rail systems and infrastructure, including connecting rail and bus services.
- Forge a long-term partnership with the federal government for program delivery.
- Develop partnerships with other transportation operators to identify efficiencies through leveraging state, regional, local, and capital program investments and maximizing connectivity between systems.
- Seek earliest feasible and best-value private-sector participation and financing with appropriate risk transfer and cost containment.
- Mitigate against the risk of funding delays by providing decision points for state policymakers to determine how and when the next steps should proceed, while leaving a fully operational system and generating economic benefits at each step.

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As part of this first step, complementary investments and improvements will be made to

### L015-83

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**Step 2—Initial High-Speed Rail Operations.** Introduction of the state's (and the nation's) first fully operational high-speed rail service will begin. This service can be operated by a private entity without subsidy, will have the potential to attract private investment to expand the system from Bay to Basin, and can be completed within a decade. The service will be blended with regional/local systems. The IOS is achieved through expansion of the first construction segment into an electrified operating high-speed rail line from Merced to Palmdale and the San Fernando Valley, accessing the populous Los Angeles Basin. Following on the work discussed above, the next priority in implementing the IOS will be closing the rail gap between Northern and Southern California by crossing the Tehachapi Mountains with new, dedicated high-speed rail infrastructure. Before completion of the IOS to the San Fernando Valley, this link will tie the north to the south at Palmdale, where Metrolink commuter rail service can then provide service and connections throughout Southern California.

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## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-83

**Step 3—The Bay to Basin System.** The dedicated high-speed rail infrastructure of the IOS will be expanded north and west to San Jose, providing HST service between the state's major population centers in the north and south and providing the platform for the transition to statewide blended operations. At this stage, passengers will be able to take a one-seat ride between greater Los Angeles (San Fernando Station) and the San Francisco Transbay Transit Center using blended infrastructure in the north between San Francisco and San Jose (assuming electrification of the Caltrain corridor by 2020 as proposed by Caltrain), using dedicated high-speed rail infrastructure between San Jose and the San Fernando Station, and, in the south, connecting via Metrolink between the San Fernando Valley Station and the Los Angeles Union Station and on to other points throughout Southern California.

**Step 4—The Phase 1 System.** For the blended approach, the dedicated high-speed rail infrastructure of the Bay to Basin system will be extended from the San Fernando Valley to Los Angeles Union Station, linking to a significantly upgraded passenger rail corridor developed to maximize service between Los Angeles and Anaheim while also addressing community concerns about new infrastructure impacts in a congested urban corridor that includes a number of established communities that abut the existing right-of-way. Under a Full Build scenario, dedicated high-speed rail infrastructure would be extended from San Jose to San Francisco's Transbay Transit Center and from Los Angeles to Anaheim.

**Step 5—The Phase 2 System.** Phase 2 will extend the high-speed rail system to Sacramento and San Diego, representing completion of the 800-mile statewide system. Travelers will be able to travel between all of the state's major population centers on high-speed rail. Phase 2 areas will see improvements in rail service well in advance of the expansion of the high-speed rail system through the combination of early investments and blended operations, as described in this Revised Plan.

### L015-84

Refer to Standard Response FB-Response-GENERAL-13.

### L015-85

Refer to Standard Response FB-Response-GENERAL-12, FB-Response-GENERAL-13, FB-Response-GENERAL-17.

### L015-86

The need for an HST System exists statewide, with regional areas contributing to this need. The Fresno to Bakersfield Section is an essential component of the statewide HST System. The need for improvements to intercity travel in California, including intercity travel between the south San Joaquin Valley, the Bay Area, Sacramento, and Southern California, relates to the following issues:

- Future growth in demand for intercity travel, including the growth in demand within the south San Joaquin Valley.
- Capacity constraints that will result in increasing congestion and travel delays, including those in the south San Joaquin Valley, particularly along the State Route (SR) 99 corridor.
- Unreliability of travel stemming from congestion and delays, weather conditions, accidents, and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in California, including the south San Joaquin Valley.
- Reduced mobility as a result of increasing demand on limited modal connections between major airports, transit systems, and passenger rail in the state, including the south San Joaquin Valley.
- Poor and deteriorating air quality and pressure on natural resources and agricultural lands as a result of expanded highways and airports and urban development pressures, including those within the south San Joaquin Valley.

Please see Chapter 1, Project Purpose, Need, and Objectives, of the EIR/EIS for additional information on the need for the proposed project.

The procedural requirements for NEPA and CEQA were followed during the environmental review of the Fresno to Bakersfield Section of the HST System.

The Authority and the FRA's prior program EIR/EIS documents (see Section 1.5, Tiering of Program EIR/EIS Documents) selected the BNSF Railway route as the preferred alternative for the Central Valley HST between Fresno and Bakersfield in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA 2005). Therefore, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF Railway corridor.

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-86**

As discussed in Section 2.3.1 of the EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under 14 CCR 15126.6 and 40 CFR 1502.15(a). This range of alternatives was analyzed in the EIR/EIS.

The project EIR/EIS for the Fresno to Bakersfield Section appropriately evaluates alternative alignments within the BNSF corridor.

### **L015-87**

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-GENERAL-25.

The purpose of the statewide HST System is to provide a reliable high-speed electrified train system that links the major metropolitan areas of the state, including the city of Bakersfield, and that delivers predictable and consistent travel times. The HST System has been planned to provide an interface with commercial airports, mass transit, and the highway network and relieve the capacity constraints of the existing transportation system as increases in intercity travel demand in California occur. Locating the Bakersfield Station adjacent to the existing Amtrak station provides an important connection between the two systems and maximizes the use of the Bakersfield transit system.

Impacts of the project on Kern County and the city of Bakersfield are discussed in Chapter 3 of the EIR/EIS.

### **L015-88**

As discussed in the Revised 2012 Business Plan (Authority 2012a), the California High-Speed Train (HST) Program will depend on a mix of public and private investment, the latter becoming available after the fundamental economics of the program are demonstrated. A phased approach to system development is the prudent course to build a foundation that allows for greater efficiency in the use of private investment once the initial segments of the system are in place.

This approach also recognizes current budgetary and funding realities. Among other things, the phased approach will help ensure the system's success by introducing

### **L015-88**

Californians to HST service and building ridership over time. At the same time, improvements can be made to regional systems that connect with HST, resulting in the conventional and high-speed systems complementing each other.

The goals of Proposition 1A were used to develop the phasing strategy for the statewide HST system and were guided by the following key principles:

- Divide the statewide high-speed rail program into a series of smaller, discrete projects that can stand alone, will provide viable revenue service, can be matched to available funding, and can be delivered through appropriate business models.
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- Mitigate against the risk of funding delays by providing decision points for state policymakers to determine how and when the next steps should proceed, while leaving a fully operational system and generating economic benefits at each step.

The Authority applied these principles, taking into account key factors such as cost, funding scenarios, and ridership and revenue projections to develop an implementation strategy with the following key steps:

**Step 1—Early Investments, Statewide Benefits.** The first construction of dedicated high-speed infrastructure for the initial operating system (IOS) begins in the Central Valley. As with all of the steps, this initial section is being developed to deliver early benefits by leveraging other systems—enabling them to operate on the new high-speed tracks, which can be done without impacts on design or the integrity of the new infrastructure. Improved passenger rail service would begin on completion of the first IOS segment by connecting the San Joaquins, ACE, Sacramento Regional Transit, and

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### **L015-88**

the Capitol Corridor (and potentially Caltrain). Through a new, strategic approach, there is also the opportunity for new or improved travel between Bakersfield and Sacramento, Oakland, San Jose, and San Francisco. This expanded Northern California Unified Service could begin operation as early as 2018, with the potential to provide transportation and economic benefits well before fully operational high-speed rail service is initiated.

As part of this first step, complementary investments and improvements will be made to both accelerate benefits and distribute them more widely across the state. These investments will be made using the \$950 million in Proposition 1A connectivity funding, available Proposition 1A high-speed rail funds, future federal funds, and other sources, and will include the following:

- Investment in the bookends: In Northern California, the long-awaited electrification of the Caltrain corridor will begin under a collaborative program between Bay Area agencies and the Authority. In addition, consistent with the Southern California MOU, investments will be made in key rail corridors in the southern part of the state, such as upgrading the Metrolink corridor from Los Angeles to Palmdale.
- The Northern California Unified Service described above will be initiated.
- As the next step in the IOS, work to close the rail gap between Bakersfield and Palmdale through the Tehachapi Mountains will begin. Environmental clearance is possible in early 2014, and plans are being developed to move quickly to implement the improvements to close this critical gap and create the first statewide rail link between the Bay Area and the Los Angeles Basin.

**Step 2—Initial High-Speed Rail Operations.** Introduction of the state's (and the nation's) first fully operational high-speed rail service will begin. This service can be operated by a private entity without subsidy, will have the potential to attract private investment to expand the system from Bay to Basin, and can be completed within a decade. The service will be blended with regional/local systems. The IOS is achieved through expansion of the first construction segment into an electrified operating high-speed rail line from Merced to Palmdale and the San Fernando Valley, accessing the populous Los Angeles Basin. Following on the work discussed above, the next priority in implementing the IOS will be closing the rail gap between Northern and Southern California by crossing the Tehachapi Mountains with new, dedicated high-speed rail infrastructure. Before completion of the IOS to the San Fernando Valley, this link will tie the north to the south at Palmdale, where Metrolink commuter rail service can then

### **L015-88**

provide service and connections throughout Southern California.

Currently, the IOS is defined as extending from Merced to the San Fernando Valley, and high-speed revenue service would only start once the full IOS is built and operable. Should ridership and revenue forecasts and financial projections demonstrate that revenue service compliant with Proposition 1A could begin earlier, with a shorter IOS, appropriate reviews would occur to consider and implement earlier service, if appropriate.

**Step 3—The Bay to Basin System.** The dedicated high-speed rail infrastructure of the IOS will be expanded north and west to San Jose, providing HST service between the state's major population centers in the north and south and providing the platform for the transition to statewide blended operations. At this stage, passengers will be able to take a one-seat ride between greater Los Angeles (San Fernando Station) and the San Francisco Transbay Transit Center using blended infrastructure in the north between San Francisco and San Jose (assuming electrification of the Caltrain corridor by 2020 as proposed by Caltrain), using dedicated high-speed rail infrastructure between San Jose and the San Fernando Station, and, in the south, connecting via Metrolink between the San Fernando Valley Station and the Los Angeles Union Station and on to other points throughout Southern California.

**Step 4—The Phase 1 System.** For the blended approach, the dedicated high-speed rail infrastructure of the Bay to Basin system will be extended from the San Fernando Valley to Los Angeles Union Station, linking to a significantly upgraded passenger rail corridor developed to maximize service between Los Angeles and Anaheim while also addressing community concerns about new infrastructure impacts in a congested urban corridor that includes a number of established communities that abut the existing right-of-way. Under a Full Build scenario, dedicated high-speed rail infrastructure would be extended from San Jose to San Francisco's Transbay Transit Center and from Los Angeles to Anaheim.

**Step 5—The Phase 2 System.** Phase 2 will extend the high-speed rail system to Sacramento and San Diego, representing completion of the 800-mile statewide system. Travelers will be able to travel between all of the state's major population centers on high-speed rail. Phase 2 areas will see improvements in rail service well in advance of the expansion of the high-speed rail system through the combination of early investments and blended operations, as described in this Revised Plan. As indicated above, the IOS is not a new Amtrak corridor. It is the first phase of

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-88

construction of a system with independent utility.

### L015-89

Refer to Standard Response FB-Response-GENERAL-17.

As discussed in the Revised 2012 Business Plan (Authority 2012a), the California High-Speed Train (HST) Program will depend on a mix of public and private investment, the latter becoming available after the fundamental economics of the program are demonstrated. A phased approach to system development is the prudent course to build a foundation that allows for greater efficiency in the use of private investment once the initial segments of the system are in place.

This approach also recognizes current budgetary and funding realities. Among other things, the phased approach will help ensure the system's success by introducing Californians to HST service and building ridership over time. At the same time, improvements can be made to regional systems that connect with HST, resulting in the conventional and high-speed systems complementing each other.

The goals of Proposition 1A were used to develop the phasing strategy for the statewide HSR system and were guided by the following key principles:

- Divide the statewide high-speed rail program into a series of smaller, discrete projects that can stand alone, will provide viable revenue service, can be matched to available funding, and can be delivered through appropriate business models.
- Advance sections as soon as feasible to realize early benefits, especially employment, and to minimize inflation impact.
- Leverage existing rail systems and infrastructure, including connecting rail and bus services.
- Forge a long-term partnership with the federal government for program delivery.
- Develop partnerships with other transportation operators to identify efficiencies through leveraging state, regional, local, and capital program investments and maximizing connectivity between systems.
- Seek earliest feasible and best-value private-sector participation and financing with appropriate risk transfer and cost containment.

### L015-89

- Mitigate against the risk of funding delays by providing decision points for state policy-makers to determine how and when the next steps should proceed while leaving a fully operational system and generating economic benefits at each step.

The Authority applied these principles, taking into account key factors such as cost, funding scenarios, and ridership and revenue projections, to develop an implementation strategy with the following key steps:

**Step 1—Early Investments, Statewide Benefits.** The first construction of dedicated high-speed infrastructure for the initial operating system (IOS) begins in the Central Valley. As with all of the steps, this initial section is being developed to deliver early benefits by leveraging other systems—enabling them to operate on the new high-speed tracks, which can be done without impacts on design or the integrity of the new infrastructure. Improved passenger rail service would begin on completion of the first IOS segment by connecting the San Joaquins, ACE, Sacramento Regional Transit, and the Capitol Corridor (and potentially Caltrain). Through a new strategic approach, there is also the opportunity for new or improved travel between Bakersfield and Sacramento, Oakland, San Jose, and San Francisco. This expanded Northern California Unified Service could begin operation as early as 2018, with the potential to provide transportation and economic benefits well before fully operational high-speed rail service is initiated.

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## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-89

the improvements to close this critical gap and create the first statewide rail link between the Bay Area and the Los Angeles Basin.

**Step 2—Initial High-Speed Rail Operations.** Introduction of the state's (and the nation's) first fully operational high-speed rail service will begin. This service can be operated by a private entity without subsidy, will have the potential to attract private investment to expand the system from Bay to Basin, and can be completed within a decade. The service will be blended with regional/local systems. The IOS is achieved through expansion of the first construction segment into an electrified operating high-speed rail line from Merced to Palmdale and the San Fernando Valley, accessing the populous Los Angeles Basin. Following on the work discussed above, the next priority in implementing the IOS will be closing the rail gap between Northern and Southern California by crossing the Tehachapi Mountains with new, dedicated high-speed rail infrastructure. Before completion of the IOS to the San Fernando Valley, this link will tie the north to the south at Palmdale, where Metrolink commuter rail service can then provide service and connections throughout Southern California.

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**Step 4—The Phase 1 System.** For the blended approach, the dedicated high-speed rail infrastructure of the Bay-to-Basin system will be extended from the San Fernando Valley

### L015-89

to Los Angeles Union Station, linking to a significantly upgraded passenger rail corridor developed to maximize service between Los Angeles and Anaheim while also addressing community concerns about new infrastructure impacts in a congested urban corridor that includes a number of established communities that abut the existing right-of-way. Under a Full Build scenario, dedicated high-speed rail infrastructure would be extended from San Jose to San Francisco's Transbay Transit Center and from Los Angeles to Anaheim.

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As indicated above, the IOS is not a new Amtrak corridor. It is the first phase of construction of a system with independent utility.

Congress has provided funding for a wide variety of infrastructure projects throughout the United States. The Passenger Rail Investment and Improvement Act (PRIIA) of 2008 established the framework for the national high-speed rail and intercity passenger rail program. Using PRIIA as a framework, in February 2009 Congress appropriated through the ARRA an investment of \$8 billion for new high-speed and intercity passenger rail grants. Congress continued to build on this ARRA funding by making available, through fiscal year (FY) 2010 appropriations, an additional \$2.1 billion, bringing the total program funding to \$10.1 billion. In 2011 Congress rescinded \$400 million of that FY 10 funding.

### L015-90

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-02, FB-Response-GENERAL-10, FB-Response-GENERAL-14, FB-Response-SO-01.

The procedural requirements for National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) were followed during the environmental review of the Fresno to Bakersfield Section of the HST System.

As described in Section 1.5, Tiering of Program EIR/EIS Documents, of the Final EIR/EIS, in the 2005 Statewide Program EIR/EIS decision document (Authority and FRA

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-90

2005), the Authority and FRA selected the BNSF Railway route as the preferred alternative for the HST System between Fresno and Bakersfield. Therefore, the Project EIR/EIS for the Fresno to Bakersfield Section focuses on alternative alignments along the general BNSF Railway corridor.

As discussed in Section 2.3.1, HST Project-Level Alternatives Development Process, of the Final EIR/EIS, the Authority implemented an alternatives analysis process to identify the full range of reasonable alternatives for the project, as required under Title 14 California Code of Regulations (CCR) Section 15126.6 and Title 40 Code of Federal Regulations (CFR) Section 1502.15(a). This range of alternatives was analyzed in the Project EIR/EIS.

The purpose of project alternatives is to minimize or avoid impacts. For the Fresno to Bakersfield Section of the HST System, alternatives were developed to reduce or avoid the impacts associated with the BNSF Alternative. The three Bakersfield alternative routes have different impacts. The BNSF Alternative would displace six religious facilities, the Bakersfield High School Industrial Arts Building, the Mercado Latino Tianguis, and 119 homes in the eastern portion of the city. In contrast to the corresponding segment of the BNSF Alternative, the Bakersfield South Alternative would not affect the Bakersfield High School campus or the Mercado Latino Tianguis. However, this alternative would displace five religious facilities, the Bethel Christian School, and 146 homes in east Bakersfield. The Bakersfield Hybrid Alternative would not affect the Bakersfield High School campus or the Bethel Christian School; however, this alternative would displace one religious facility, the Mercado Latino Tianguis, the Bakersfield Homeless Shelter, and 57 homes in east Bakersfield.

Where facilities or land is taken in Bakersfield for purposes of the HST project, the Authority will pay just compensation. Just compensation includes public land and facilities. For more than a year, the Authority has been discussing with the City of Bakersfield the project's impacts on City facilities. The purpose of these discussions has been to identify the City's specific concerns and to offer means to compensate the City.

### L015-91

Impacts to the Bakersfield Convention Center overflow parking lot are discussed in

### L015-91

EIR/EIS Volume I Chapter 3.2 Transportation, Impact TR #13- Impacts on the Local Roadway Network due to Station Activity. The Bakersfield Convention Center overflow lot has a total of 660 parking spaces; 332 of those spaces (50.3%) would be removed for the BNSF Alternative, 482 spaces (73%) would be removed for the Bakersfield South Alternative, and 423 spaces (64.1%) would be removed for the Bakersfield Hybrid Alternative. To minimize the potential for permanent parking loss affecting this facility's ability to meet the city of Bakersfield's minimum parking requirements, the Authority will ensure that existing parking that is removed will be replaced so all existing parking demand will be met with off-street parking.

Parking replacement will be achieved through the utilization of existing vacant lots within the close vicinity of this facility or dedicated shared use of parking spaces constructed as part of the Bakersfield HST Station. This effect would have negligible intensity under NEPA and would be a less-than-significant impact under CEQA. Consequently, no effects on the ability of the Bakersfield Convention Center to hold conventions or events, or the transient occupancy taxes collected would occur.

### L015-92

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-SO-02, FB-Response-TR-03.

A Downtown Bakersfield station is consistent with the objectives of the HST project and would fulfill a need to provide a convenient mode of travel to the major urban centers of the San Joaquin Valley. The project will require the removal of a number of existing structures and uses, as described in Section 3.12.8, Environmental Consequences, of the Final EIR/EIS. However, that impact does not require the project to be abandoned. If that were the case, the City (and Caltrans) would not be able to proceed with the proposed 24th Street Improvement Project, which will require the acquisition of homes and businesses in central Bakersfield to support the widening and re-routing of 24th Street.

The stations are conceptual in nature, as discussed in Section 2.4.4.3, Bakersfield Station Alternatives. No substantial design has been undertaken for any of the stations, so their actual configuration has not been established. For purposes of environmental review and to avoid underestimating the potential effects of the stations, the planning

## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

### L015-92

and design assumptions for the stations throughout the implementation of the HST System involve phases and reflect forecast ridership under the “high” scenario (ticket price at 50% of air fare).

### L015-93

Refer to Standard Response FB-Response-GENERAL-01.

As required by CEQA, mitigation measures have been identified in the EIR/EIS for each significant impact. The Authority analyzed the system impacts in the 2005 program EIR (Authority and FRA 2005) and made mitigation commitments to be refined and applied based on future project EIR/EIS analyses. The present project-level EIR/EIS has analyzed the potential project-specific impacts of the Fresno to Bakersfield Section of the HST System (see Sections 3.2 through 3.19). The EIR/EIS provides an extensive set of mitigation measures using performance standards, which are expected to be adopted in project approval decisions made in the future by the Authority and the FRA.

### L015-94

Refer to Standard Response FB-Response-GENERAL-07.

### L015-95

Because the Fresno to Bakersfield Section alignment alternatives extend south of the project’s southern terminus at Baker Street, the impact analysis presented in this Revised DEIR/Supplemental DEIS extends through Bakersfield to Oswell Street to provide analysis and comparison of impacts for the full length of alignment alternatives carried forward. Mitigation measures have been recommended for the significant impacts identified in the Revised DEIR/Supplemental DEIS Fresno to Bakersfield study area. The Bakersfield to Palmdale Section EIR/EIS will assess impacts east of Oswell Street to Palmdale.

The Authority has met several times with City of Bakersfield staff and have addressed most of their concerns. The Bakersfield Hybrid Alternative was developed in response to City of Bakersfield staff concerns.

### L015-95

The Authority and FRA used the information in the Revised DEIR/Supplemental DEIS and input from agencies and the public to identify the Preferred Alternative. The decision included consideration of the project purpose and need and the project objectives, presented in Chapter 1, Project Purpose, Need, and Objectives; the objectives and criteria in the alternatives analysis; and the comparative potential for environmental impacts.

Revisions were made, where appropriate, in the Revised DEIR/Supplemental DEIS in response to comments received on the Draft EIR/EIS. Comments received on the Draft EIR/EIS have been responded to in Volume IV of this Final EIR/EIS.

### L015-96

Refer to Standard Response FB-Response-GENERAL-17.

### L015-97

Refer to Standard Response FB-Response-GENERAL-17.

In response to question 64 of the comment, the Authority has been actively working to add management resources and agency staff. As described in the staffing report submitted to the Legislature on October 1, 2012, the Authority filled 33 positions between July 2011 and October 2012. These positions included hiring a new Chief Executive Officer, Chief Deputy Director, Chief Counsel, Chief of External Affairs, Risk Manager, Regional Director, and others. Also, since submitting that report, the Authority hired a Chief Program Manager and Chief Financial Officer and continues to expand its other staff positions.

In response to question 65 of the comment, the commenter is correct that the Peer Review Group did not recommend the sale of Proposition 1A bonds. However, the California legislature deemed it was in the best interest of the state to proceed with the project, and voted on July 6, 2012, to approve Senate Bill (SB) 1029 to appropriate construction funds to the Authority. The Governor signed SB 1029 on July 18, 2012.

In response to question 66 of the comment, as described on page ES-4 of the Revised 2012 Business Plan (Authority 2012a) and consistent with the requirements of

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## Response to Submission L015 (Lorelei H. Oviatt, County of Kern, Planning and Community Development Department, October 19, 2012) - Continued

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### **L015-97**

Proposition 1A, "construction of any segment would only proceed when funding is identified and the Legislature has approved the use of additional state funding." Also, each of these segments is required to have independent utility so they can produce benefits to the state while future segments are being built.

### **L015-98**

Refer to Standard Response FB-Response-GENERAL-01, FB-Response-GENERAL-03, FB-Response-GENERAL-21.

Although this EIR/EIS is a project-level document, the project itself is not typical. The project is over 100 miles long, and the project design is based on preliminary engineering for the alternative alignments. Accordingly, the project-level detail for this project will necessarily be more general and regional than would be the case for a typical project, such as a subdivision or conditional use permit.

### **L015-99**

Some revisions were made in the Revised DEIR/Supplemental DEIS, where it was determined to be appropriate, in response to Kern County's comments on the Draft EIR/EIS. Responses to all of Kern County's comments on the Draft EIR/EIS are provided in Volume IV of this Final EIR/EIS.

Submission L016 (Kevin Hamilton, County of Kern, Engineering, Surveying and Permit Services  
Department, October 19, 2012)

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PERMIT SERVICES DEPARTMENT**  
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**DEVELOPMENT SERVICES AGENCY**  
Engineering, Surveying and Permit Services Department  
Planning and Community Development Department  
Roads Department

October 19, 2012

Via Facsimile

California High-Speed Rail Authority  
770 L Street, Suite 800  
Sacramento CA 95814

**Subject: California High-Speed Rail, Fresno to Bakersfield Revised Draft  
EIR/Supplemental Draft EIS Comment**

There are several County of Kern drainage and sewer facilities that will be affected by the California High-Speed Rail (HSR) proposed alignments. These facilities include storm water drainage basins, a sewer lift station and associated force main, and a storm drain pipeline system. The locations of the above mentioned facilities are from review of *Volume III: Section B—Alignment Plans, Part 2 of 2* and are as follows:

Proposed Alignment	Sheet	Station	Description
B1 B2 B3	Sheet 3 of 36 Sheet 3 of 37 Sheet 3 of 32	6382 + 00	Jomani Dr. Drainage Basin
B1 B2 B3	Sheet 3 of 36 Sheet 3 of 37 Sheet 3 of 32	6834 + 00	Jomani Dr. Sewer Lift Station (force main runs along current BNSF alignment)
B1 B2 B3	Sheet 3 of 36 Sheet 3 of 37 Sheet 3 of 32	6841 + 00	Piedmont Ave. Drainage Basin—affected by BNSF re-alignment
B1 B2 B3	Sheet 3 of 36 Sheet 3 of 37 Sheet 3 of 32	6847 + 00	Snowberry Ln. Drainage Basin
B1 B2 B3	Sheet 3 of 36 Sheet 3 of 37 Sheet 3 of 32	6855 + 00	Cactus Ln. Drainage Basin—affected by BNSF re-alignment
B1 B2 B3	Sheet 5 of 36 Sheet 5 of 37 Sheet 5 of 32	6902 + 00	Enger St. Drainage Basin (behind residence)
B1 B2 B3	Sheet 27 of 36 Sheet 27 of 37 Sheet 27 of 32	7429 + 00	Storm drain system at Oswell Ave. (frontage) and Edison Hwy.

County Surveyor- Building Inspection- Drainage - Floodplain- Special Districts- Code Compliance  
TTY Relay - 1-800-735-2929

County of Kern  
California HSR—Fresno to Bakersfield  
Revised Draft EIR/Supplemental Draft EIS Comment

October 19, 2012

Page 2 of 2

Thank you for this opportunity to provide comments to the Revised Draft EIR/Supplemental Draft EIS.

If you have any questions or comments please contact me at (661) 862-5071, e-mail at [kevinh@co.kern.ca.us](mailto:kevinh@co.kern.ca.us) or by mail.

Sincerely,  
Charles Lackey, P.E., Director

*Kevin L. Hamilton*  
By: Kevin L. Hamilton

KH/kjh  
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Response to Submission L016 (Kevin Hamilton, County of Kern, Engineering, Surveying and Permit Services Department, October 19, 2012)

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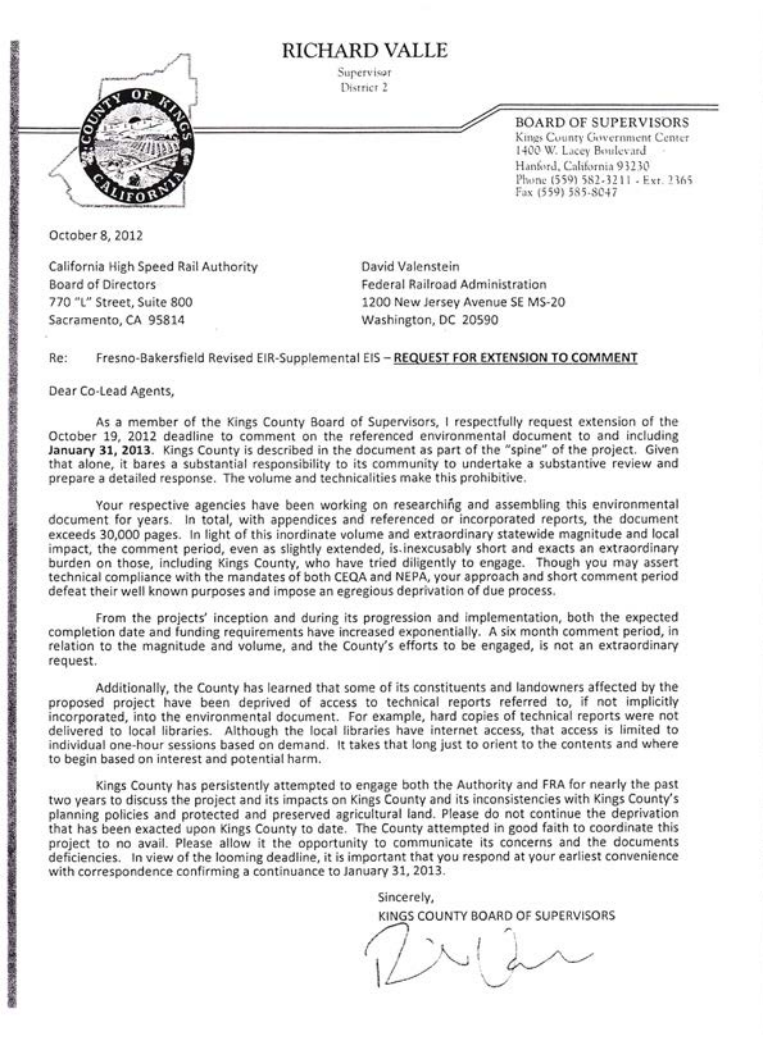
**L016-1**

Refer to Standard Response FB-Response-PU&E-03.

The Authority appreciates the detailed information provided by the Engineering, Surveying and Permit Services Department. As engineering design develops, the design-build contractor will continue to coordinate with utility owners to provide efficient relocation of utility facilities.

Submission L017 (Richard Valle, County of Kings Board of Supervisors, October 8, 2012)

L017-1



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Response to Submission L017 (Richard Valle, County of Kings Board of Supervisors, October 8, 2012)

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**L017-1**

Refer to Standard Response FB-Response-GENERAL-07.

Submission L018 (Doug Verboon, County of Kings Board of Supervisors, October 9, 2012)

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KINGS COUNTY COUNSEL

PAGE 01/03

KINGS COUNTY COUNSEL

Fax No.: (559) 584-0865

TRANSMITTAL MEMO

Date: 10.9.2012

Please Deliver to: CHSRA 916.322.0827  
David Valenstein 202.493.6330

Fax Number:

From: Kings Co. Counsel - Colleen Carlson

Transmitting 3 pages (including this Transmittal Memo)

If all pages are NOT received please immediately telephone our office: 582-3211, Ext. 2445

\*\*\*\*\*  
(Use this portion only for important dated material)

Hard Copy to Follow  
Verification Requested,  
Please Telephone  
For Your Review and Comment

For your Information  
Please Reply ASAP  
cc:

MESSAGE:

THE INFORMATION CONTAINED IN THIS FACSIMILE MESSAGE IS INTENDED ONLY FOR THE PERSONAL AND CONFIDENTIAL USE OF THE DESIGNATED RECIPIENT(S) NAMED ABOVE. THIS MESSAGE MAY BE AN ATTORNEY-CLIENT COMMUNICATION, AND AS SUCH IS PRIVILEGED AND CONFIDENTIAL. IF THE READER OF THIS MESSAGE IS NOT THE INTENDED RECIPIENT OR AN AGENT RESPONSIBLE FOR DELIVERING IT TO THE INTENDED RECIPIENT, YOU ARE HEREBY NOTIFIED THAT YOU HAVE RECEIVED THIS DOCUMENT IN ERROR AND THAT ANY REVIEW, DISSEMINATION, DISTRIBUTION OR COPYING OF THIS MESSAGE IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS COMMUNICATION IN ERROR, PLEASE NOTIFY US IMMEDIATELY BY TELEPHONE AND RETURN THE ORIGINAL MESSAGE TO US BY MAIL. THANK YOU.  
hmsiothx

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KINGS COUNTY COUNSEL

PAGE 02/03

DOUG VERBOON

Supervisor  
District 3



BOARD OF SUPERVISORS  
Kings County Government Center  
1400 W. Lacey Boulevard  
Hanford, California 93230  
Phone (559) 582-3211 • Ext. 2366  
Fax (559) 585-8047

October 8, 2012

California High Speed Rail Authority  
Board of Directors  
770 "L" Street, Suite 800  
Sacramento, CA 95814

David Valenstein  
Federal Railroad Administration  
1200 New Jersey Avenue SE MS-20  
Washington, DC 20590

Re: Fresno-Bakersfield Revised EIR-Supplemental EIS - REQUEST FOR EXTENSION TO COMMENT

Dear Co-Lead Agents,

As a member of the Kings County Board of Supervisors, I respectfully request extension of the October 19, 2012 deadline to comment on the referenced environmental document to and including January 31, 2013. Kings County is described in the document as part of the "spine" of the project. Given that alone, it bares a substantial responsibility to its community to undertake a substantive review and prepare a detailed response. The volume and technicalities make this prohibitive.

Your respective agencies have been working on researching and assembling this environmental document for years. In total, with appendices and referenced or incorporated reports, the document exceeds 30,000 pages. In light of this inordinate volume and extraordinary statewide magnitude and local impact, the comment period, even as slightly extended, is inexcusably short and exacts an extraordinary burden on those, including Kings County, who have tried diligently to engage. Though you may assert technical compliance with the mandates of both CEQA and NEPA, your approach and short comment period defeat their well known purposes and impose an egregious deprivation of due process.

From the projects' inception and during its progression and implementation, both the expected completion date and funding requirements have increased exponentially. A six month comment period, in relation to the magnitude and volume, and the County's efforts to be engaged, is not an extraordinary request.

Additionally, the County has learned that some of its constituents and landowners affected by the proposed project have been deprived of access to technical reports referred to, if not implicitly incorporated, into the environmental document. For example, hard copies of technical reports were not delivered to local libraries. Although the local libraries have internet access, that access is limited to individual one-hour sessions based on demand. It takes that long just to orient to the contents and where to begin based on interest and potential harm.

Kings County has persistently attempted to engage both the Authority and FRA for nearly the past two years to discuss the project and its impacts on Kings County and its inconsistencies with Kings County's planning policies and protected and preserved agricultural land. Please do not continue the deprivation that has been exacted upon Kings County to date. The County attempted in good faith to coordinate this project to no avail. Please allow it the opportunity to communicate its concerns and the documents deficiencies. In view of the looming deadline, it is important that you respond at your earliest convenience with correspondence confirming a continuance to January 31, 2013.

Sincerely,  
KINGS COUNTY BOARD OF SUPERVISORS

Doug Verboon

Submission L018 (Doug Verboon, County of Kings Board of Supervisors, October 9, 2012) - Continued

10/09/2012 01:48 5555848865

KINGS COUNTY COUNSEL

PAGE 03/03



RICHARD VALLE

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October 8, 2012

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David Valenstein  
Federal Railroad Administration  
1200 New Jersey Avenue SE MS-20  
Washington, DC 20590

Re: Fresno-Bakersfield Revised EIR-Supplemental EIS – REQUEST FOR EXTENSION TO COMMENT

Dear Co-Lead Agents,

As a member of the Kings County Board of Supervisors, I respectfully request extension of the October 19, 2012 deadline to comment on the referenced environmental document to and including January 31, 2013. Kings County is described in the document as part of the "spine" of the project. Given that alone, it bares a substantial responsibility to its community to undertake a substantive review and prepare a detailed response. The volume and technicalities make this prohibitive.

Your respective agencies have been working on researching and assembling this environmental document for years. In total, with appendices and referenced or incorporated reports, the document exceeds 30,000 pages. In light of this inordinate volume and extraordinary statewide magnitude and local impact, the comment period, even as slightly extended, is inexcusably short and exacts an extraordinary burden on those, including Kings County, who have tried diligently to engage. Though you may assert technical compliance with the mandates of both CEQA and NEPA, your approach and short comment period defeat their well known purposes and impose an egregious deprivation of due process.

From the projects' inception and during its progression and implementation, both the expected completion date and funding requirements have increased exponentially. A six month comment period, in relation to the magnitude and volume, and the County's efforts to be engaged, is not an extraordinary request.

Additionally, the County has learned that some of its constituents and landowners affected by the proposed project have been deprived of access to technical reports referred to, if not implicitly incorporated, into the environmental document. For example, hard copies of technical reports were not delivered to local libraries. Although the local libraries have internet access, that access is limited to individual one-hour sessions based on demand. It takes that long just to orient to the contents and where to begin based on interest and potential harm.

Kings County has persistently attempted to engage both the Authority and FRA for nearly the past two years to discuss the project and its impacts on Kings County and its inconsistencies with Kings County's planning policies and protected and preserved agricultural land. Please do not continue the deprivation that has been exacted upon Kings County to date. The County attempted in good faith to coordinate this project to no avail. Please allow it the opportunity to communicate its concerns and the documents deficiencies. In view of the looming deadline, it is important that you respond at your earliest convenience with correspondence confirming a continuance to January 31, 2013.

Sincerely,  
KINGS COUNTY BOARD OF SUPERVISORS

A handwritten signature in dark ink, appearing to read "Richard Valle".

## Response to Submission L018 (Doug Verboon, County of Kings Board of Supervisors, October 9, 2012)

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### L018-1

Refer to Standard Response FB-Response-GENERAL-07.

### L018-2

Refer to Standard Response FB-Response-GENERAL-07.

The intent of the public workshops was to inform and engage stakeholders and the community about the proposed alignments as they progress through the environmental review process. Resource area experts and associated stations were set up throughout the room to facilitate discussion on the details of the content of the environmental document, how to make public comments, and the general timeline for environmental review.

Some commenters have asked about the availability of technical reports prepared in support of the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS. Technical reports were prepared to record additional details on the environmental setting, impact assessment methodology, and environmental impacts for the following environmental disciplines: transportation, air quality, noise and vibration, biological resources and wetlands, geology, hazardous wastes, community impacts, relocations, aesthetics and visual resources, and cultural resources. Preparation of technical reports is not required by CEQA or NEPA. Also, CEQA and NEPA do not require that these reports be distributed for public review with an EIR/EIS. However, all of the technical reports except for the reports on cultural resources were posted on the Authority's website for public review at the same time as the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS. The availability of these technical reports was noted in the notices to agencies, elected officials, Native American tribes, organizations, individuals on the project's mailing list, and owners of land adjoining and near the alternative alignments.

The cultural resources technical reports were not made available to the general public to protect those resources. Specific locations of wetlands and known populations of threatened and endangered species were also redacted from the biological resources and wetlands technical reports made available to the general public to protect those resources. The Authority and FRA provided the cultural resources technical reports and redacted biological and wetlands information to experts in the fields of historic architecture, archaeology, and biology on their request.

### L018-3

The Authority and FRA recognize the concerns of Kings County representatives and community members, and we wish to maintain an open dialogue about the project. The Authority welcomes the opportunity to meet with landowners and stakeholders. Also, project-level information has been shared at public meetings, made available at the Kings County project office, and provided through mailings, e-mail communication, outreach materials, and on the Internet.

Submission L019 (Richard Valle, County of Kings Board of Supervisors, October 18, 2012)

 **RICHARD VALLE**  
Supervisor  
District 2

**RECEIVED**  
10/18/2012

**BOARD OF SUPERVISORS**  
Kings County Government Center  
1400 W. Lacey Boulevard  
Hanford, California 93232  
Phone (559) 583-3711 • Ext. 3365  
Fax (559) 583-8047

October 11, 2012

**California High-Speed Rail Authority Board**  
770 L Street, Suite 800  
Sacramento, California 95814  
916-324-1541 [boardmembers@hsr.ca.gov](mailto:boardmembers@hsr.ca.gov)

**Dan Richard, Chair**  
**Lynn Schenk, Vice-Chair**  
**Thomas Richards, Vice-Chair**  
**Thomas Umberg**  
**Robert Balgenorth**  
**Jim Hartnett**  
**Michael Rossi**  
**Specialist**

**Federal Railroad Administration**  
1200 New Jersey Avenue, SE  
MS-20  
Washington, DC 20590  
**David Valenstein, Division Chief**  
Office of Passenger & Freight Programs  
202-493-6368 [david.valenstein@dot.gov](mailto:david.valenstein@dot.gov)  
**Kathryn Hurd, Attorney Advisor**  
Office of Chief Counsel  
202-493-0407 [kathryn.hurd@dot.gov](mailto:kathryn.hurd@dot.gov)  
**Stephanie Perez, Environmental Protection**  
Office of Railroad Policy & Development  
202-493-0388 [stephanie.perez@dot.gov](mailto:stephanie.perez@dot.gov)

Dear California High-Speed Rail Authority Board Members and Federal Railroad Administration Officials,

L019-1 | Our community's comments about the California High-Speed Train (HST) project's Fresno to Bakersfield Revised Draft Environmental Impact Report/Statement (RDEIRS), are attached. We, the citizens of the City of Corcoran and the unincorporated areas surrounding the city, strongly object to the manner that this project has been planned and is being implemented in our community.

L019-2 | We object to the limited concern that the California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) have demonstrated for the survival of this community, this city and Kings County at large. The Authority and the FRA have both failed to design a project that is in harmony with the General Plans of the City of Corcoran's and the County of Kings. There has been limited and not enough meaningful interaction between the Authority's technical staff and the city and county planning staffs to incorporate the needs of the citizens of the city and county. The RDEIRS that we are commenting on, woefully demonstrates the Authority's and the FRA's lack of due diligence in their planning activities.

L019-3 | To make matters worse, the Authority and the FRA have failed to properly distribute copies of RDEIRS for the public to review, in languages spoken in this region and in locations that are open to the public during hours when most people are not at work, so that the public can actually study the document and participate in this process. To make matters even more unreasonable, the Authority has failed to release to public locations the 14,000-pages of Technical Reports that we need to review to understand the RDEIRS.

 **RICHARD VALLE**  
Supervisor  
District 2

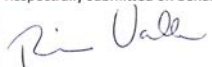
**BOARD OF SUPERVISORS**  
Kings County Government Center  
1400 W. Lacey Boulevard  
Hanford, California 93232  
Phone (559) 583-3711 • Ext. 3365  
Fax (559) 583-8047

**California High-Speed Rail Authority Board Members and Federal Railroad Administration Officials**  
October 11, 2012  
Page-2 of 2

So our comments are attached, they were prepared from the inadequate and incomplete information that you have released to us.

You must release the missing documents that were used to create the RDEIRS and give us reasonable time to review those documents and allow us to participate in the California Environmental Quality Act and the National Environmental Policy Act.

Respectfully submitted on behalf of my community,

  
**Richard Valle**  
District-2 Supervisor  
Kings County

  
**Raymond Lerma**  
Mayor  
City of Corcoran

Attachments: RDEIRS Comments

Pc: File



Submission L019 (Richard Valle, County of Kings Board of Supervisors, October 18, 2012) - Continued

Richard Hook  
Charlene Hook  
Edward A. Fernandez  
John Richard  
Faith Rector  
Ann Kramer  
Mary Gonzalez-Hong  
Gloria Van Joy  
Floria H. Perez  
Soborno Palmerin  
Paul A. Santa  
Michael White  
John

Lucia Cruz Writing III

Orlando C. C.  
Guadalupe Elias  
Angie Pringle  
Bonnie Figueroa  
Mayra Velazquez

Esther Cervantes  
Romana M. Prieto  
Carmen Gutierrez  
Paul Cervantes  
Joe R. Morales Jr.  
Alexandria Ledesma  
Manuel Llamas  
Rafael Gonzalez  
Vincent B. Barata  
Margaret Garcia  
Carmen Valanquez  
Mike Liron  
MICHAEL HERNANDEZ  
DAVID JACOB BEGA

## Response to Submission L019 (Richard Valle, County of Kings Board of Supervisors, October 18, 2012)

### L019-1

Refer to Standard Response FB-Response-GENERAL-14.

Your opposition to the project is noted.

### L019-2

The Authority and FRA recognize the concerns of Kings County representatives and community members, and we wish to maintain an open dialogue about the project. The Authority welcomes the opportunity to meet with landowners and stakeholders. Also, project-level information has been shared at public meetings, made available at the Kings County project office, and provided through mailings, e-mail communication, outreach materials, and on the Internet.

### L019-3

Refer to Standard Response FB-Response-SO-07.

The public outreach process for the Fresno to Bakersfield Section of the HST System has been extensive; this process has included hundreds of public meetings and briefings where public comments have been received, participation in community events, and public educational materials have been developed and distributed to encourage feedback. These efforts are cited in Chapter 7 of the Revised DEIR/Supplemental DEIS.

Public notification regarding the draft environmental documents took place in the following ways: A notification letter, informational brochure, and Notice of Availability (NOA) were prepared in English and Spanish and sent to landowners and tenants within 300 feet of all proposed alignment alternatives. The letters notified the landowners and tenants that their property could become necessary for construction (within the project construction footprint) of one or more of the proposed alignment alternatives or project components being evaluated. Anyone who has requested to be notified or is in our stakeholder database was sent notification materials in English and Spanish. An e-mail communication about the notification materials was distributed to the entire stakeholder database. Public notices were placed in English- and Spanish-language newspapers. Posters in English and Spanish were posted along the project right-of-way. Public workshops were held from 4:00 to 7:00 p.m. and public hearings were held from 3:00 to

### L019-3

8:00 p.m. to ensure the widest amount of participation. The Authority and FRA have undertaken substantial outreach to Environmental Justice communities. Materials translated into Spanish included the Executive Summary, Notice of Preparation, a summary of the highlights of the Draft EIR/EIS, an overview brochure of the Draft EIR/EIS, and comment cards at the public workshops and hearings. Also, a multi-lingual, toll-free hotline was made available for public comments and requests.

Some comments have asked about the availability of technical reports prepared in support of the Draft EIR/EIS and Revised DEIR/Supplemental DEIS. Technical reports were prepared to record additional details about the environmental setting, impact assessment methodology, and environmental impacts for the following environmental disciplines: transportation, air quality, noise and vibration, biological resources and wetlands, geology, hazardous wastes, community impacts, relocations, cultural resources, and aesthetics and visual resources. Preparation of technical reports is not required by CEQA or NEPA. CEQA and NEPA do not require that these reports be distributed for public review with an EIR/EIS. However, all of the technical reports except for the reports on cultural resources were posted on the Authority's website for public review at the same time as the Draft EIR/EIS and the Revised DEIR/Supplemental DEIS. The availability of these technical reports was noted in the notices to agencies, elected officials, Native American tribes, organizations, individuals on the project's mailing list, and owners of land adjoining and near the alternative alignments.

The cultural resources technical reports were not made available to the general public to protect those resources. Also, the specific locations of wetlands and the locations of known populations of threatened and endangered species were redacted from the biological resources and wetlands technical reports made available to the general public to protect those resources. The Authority and FRA provided the cultural resources technical reports and redacted biological and wetlands information to experts in the fields of historic architecture, archaeology, and biology on their request.

COUNTY OF TULARE  
COUNTY ADMINISTRATIVE OFFICE

JEAN M. ROUSSEAU  
County Administrative Officer

KRISTIN BENNETT  
Assistant County Administrative Officer

September 26, 2012

Fresno to Bakersfield Revised Draft EIR/  
Supplemental Draft EIS Comment  
770 L Street, Suite 800  
Sacramento, CA 95814

Re: Fresno to Bakersfield Section High Speed Train Revised Draft EIR/Supplemental Draft  
EIS

To whom it may concern:

Thank you for the opportunity to review and comment on the Fresno to Bakersfield Section High Speed Train Revised Draft EIR/Supplemental Draft EIS (Draft Environmental Document) prepared for the California High Speed Train Rail Authority (Project).

Please note that Tulare County provided written comments on October 3, 2011 where we emphasized the importance of farm land within our County and our region. The Tulare County Agricultural Commissioner reported a total gross production value in excess of \$5.6 billion during 2011, thus making Tulare County the number one agricultural producing county in the nation and thereby a world class agricultural region. In light of this significant level of agricultural production, we remain committed to keeping agriculture viable in Tulare County and we would like to reiterate our strongest desire that impacts to agriculture be minimized to the extent feasible.

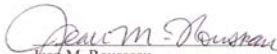
We noted previously that the Draft Environmental Document included additional analysis to alternatives affecting what is known as the "Hanford West Bypass 1 and 2 Alternatives" and another alternative known as the "Bakersfield Hybrid Alternative". Neither of these alternatives would affect the previous version of the environmental documents as it pertains to impacts to Tulare County. As contained in our letter of October 3, 2011, overall, 461 acres of agriculturally productive land (essentially at the width of the right-of-way along the length that the Project traverses the County), could be impacted by the Project. One alternative (Corcoran Bypass, 2 miles in length) would affect 240 acres while the other (Allensworth Bypass, 9 miles in length) would affect 221 acres. As these segments of the Project will not be affected by the inclusion of the Hanford West Bypass 1 and 2 Alternatives or the Bakersfield Hybrid Alternative, we are not aware of any substantial physical changes that would lessen or further impacts to Tulare County.

September 26, 2012  
Page 2

L020-3

In conclusion, we respectfully request that regardless of selection of a preferred Alternative, reasonably feasible efforts be undertaken to avoid or mitigate potential physical impacts to retain our County's agricultural viability and to minimize or avoid the creation of unnecessary hardships to agricultural property owners and/or producers. Thank you for your consideration.

Sincerely,

  
Jean M. Rousseau  
County Administrative Officer

L020-1

L020-2

Administration Building

2800 W. Burrel, Visalia, CA 93291

(559) 636-5005 FAX: (559) 733-6318

Submission L020 (Jean M. Rousseau, County of Tulare, County Administrative Office, September 28, 2012) - Continued



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Response to Submission L020 (Jean M. Rousseau, County of Tulare, County Administrative Office,  
September 28, 2012)

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**L020-1**

Refer to Standard Response FB-Response-GENERAL-04.

The Authority agrees that Tulare County is an important agricultural county and will minimize as many agricultural impacts as possible.

**L020-2**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-04, FB-Response-GENERAL-10, FB-Response-AG-01.

**L020-3**

Refer to Standard Response FB-Response-GENERAL-02, FB-Response-GENERAL-04, FB-Response-GENERAL-10, FB-Response-AG-01.

Submission L021 (William Stretch, Fresno Irrigation District, October 19, 2012)



October 19, 2012

California High Speed Rail Authority  
770 L Street, Suite 800  
Sacramento, CA 95814

RE: Revised Draft EIR/Supplemental Draft EIS Comments  
Fresno to Bakersfield Section  
FID Facilities: Various

Dear Sir or Madam:

L021-1

The Fresno Irrigation District (FID) has reviewed the California High Speed Rail Authority's (CHSRA's) Revised Draft EIR/Supplemental Draft. As has been documented in past correspondence to the CHSRA, there are FID facilities within the Fresno to Bakersfield segment that will be impacted by the proposed project. FID resubmits to the CHSRA the comments provided in a letter from FID dated October 13, 2011. There have also been several meetings and correspondence with CHSRA's representatives and consultants, including correspondence from FID dated May 16, 2012 and May 17, 2012 regarding the plans for segments 1A, 1B and 1C. Please note that there are additional FID facilities south of segment 1C (south of American Avenue) and FID's boundary (South Avenue) that will be impacted including FID's Washington Colony No. 15, Wilson No. 230, Oleander-North Branch No. 17, Oleander-South Branch No. 18, and the Oleander-South Branch of the South Branch No. 19. The location of those facilities has been marked on the attached plan sheets, and reference is made to the location map and comments provided in the October 13, 2011 regarding these facilities.

Should you have any further questions or concerns in regard to the subject matter, please feel free to contact me at 559-233-7161, extension 7401.

Sincerely,

*William R. Stretch*  
William R. Stretch  
Chief Engineer

California High Speed Rail Authority  
Re: California High-Speed Train – Merced to Fresno to Bakersfield  
Revised Draft EIR/Supplemental Draft EIS  
October 19, 2012  
Page 2 of 2

Attachments: HSR - Facility Map & Table 20111013  
CHSRA 15% Plans Identifying FID Facilities-Fresno to Bakersfield

cc: Tony Valdez (Parsons Brinckerhoff);  
Murray Peters (Parsons Brinckerhoff);  
Gary R. Serrato (FID);  
Laurence Kimura (FID)

BOARD OF DIRECTORS President JEFFREY NEELY, Vice-President RYAN JACOBSEN  
STEVEN BALLS, GEORGE PORTER, JERALD REBENSCHNOR General Manager GARY R. SERRATO

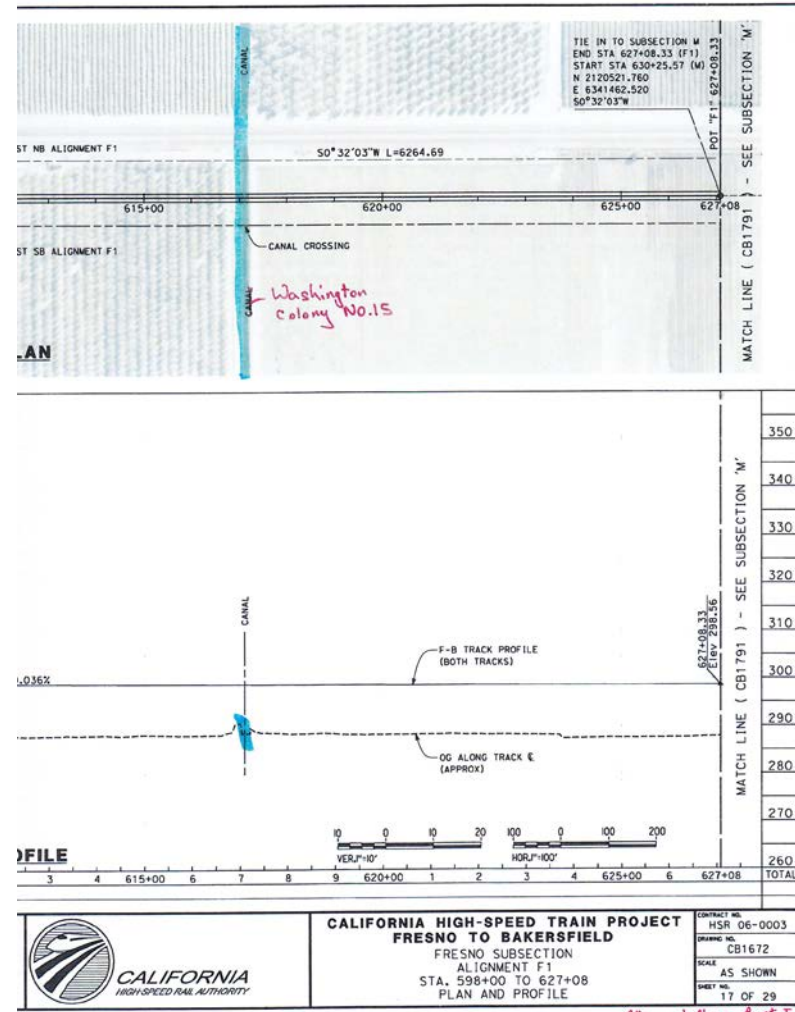
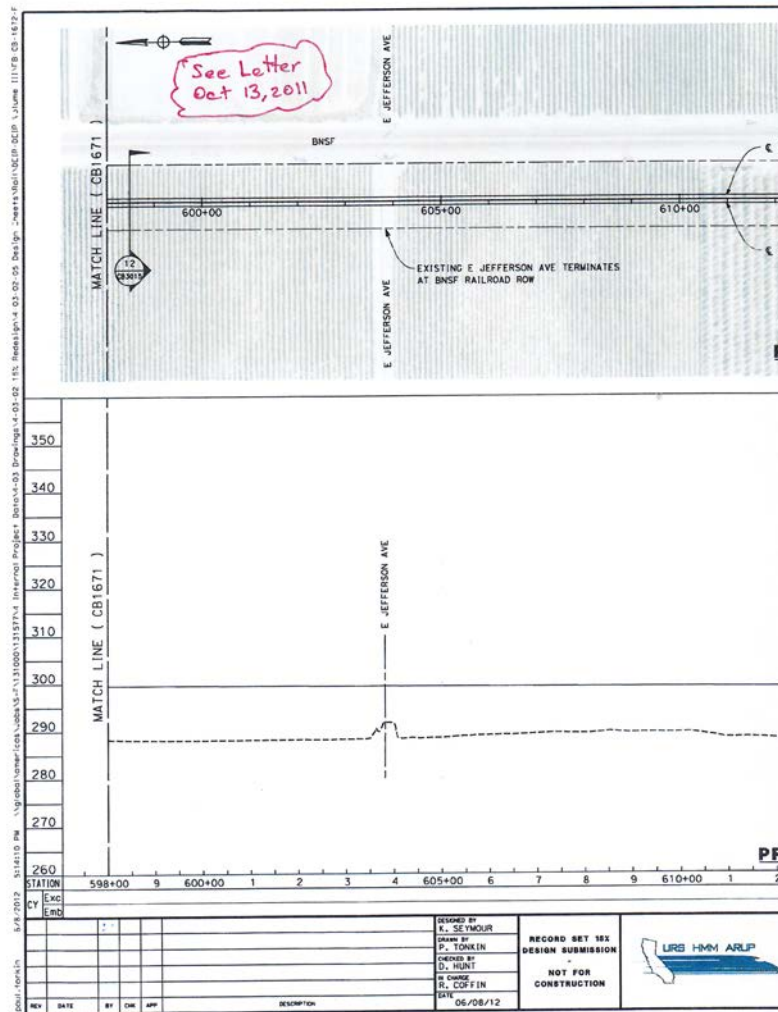
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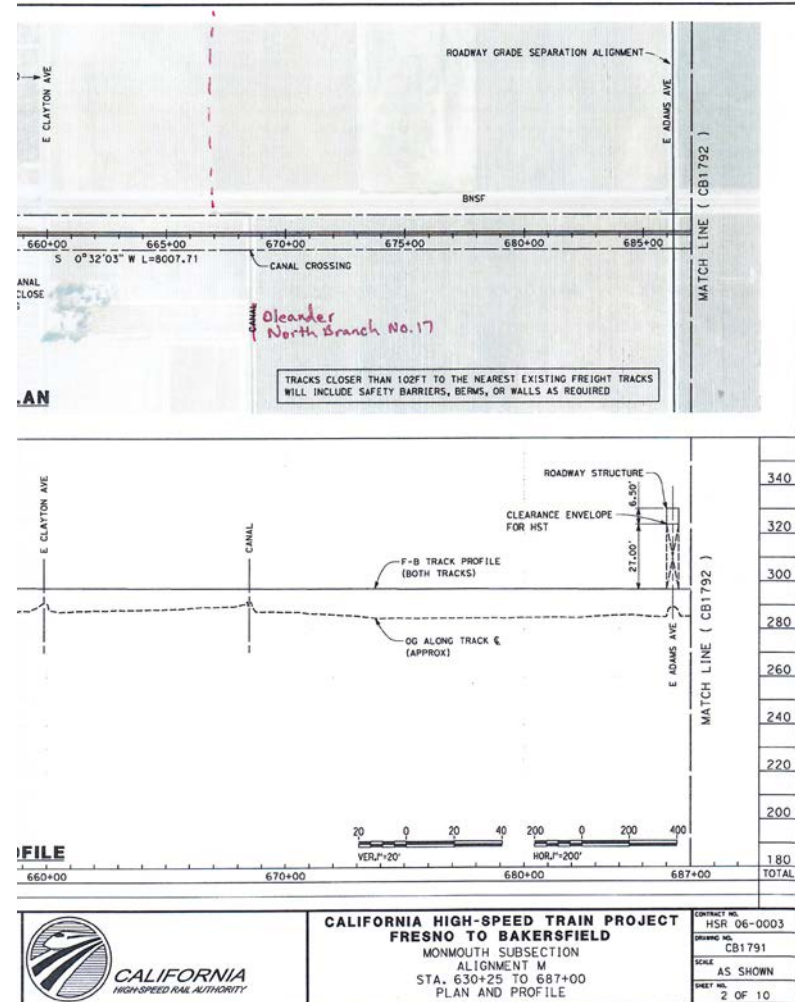
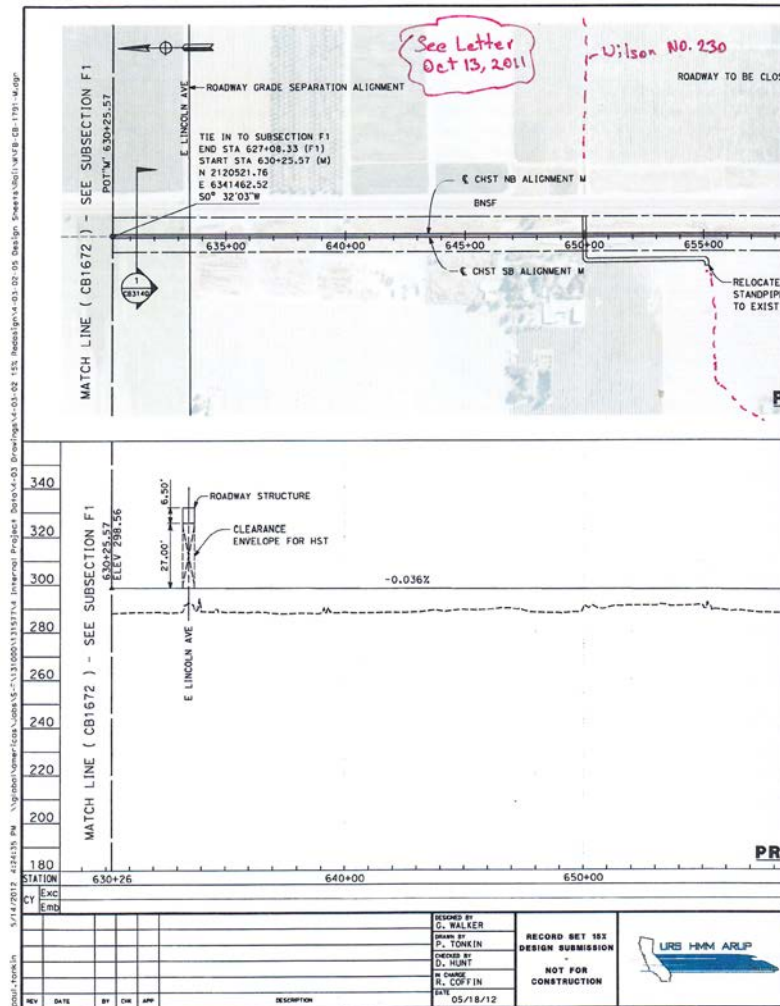
CALIFORNIA  
High-Speed Rail Authority

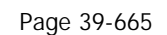
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Submission L021 (William Stretch, Fresno Irrigation District, October 19, 2012) - Continued



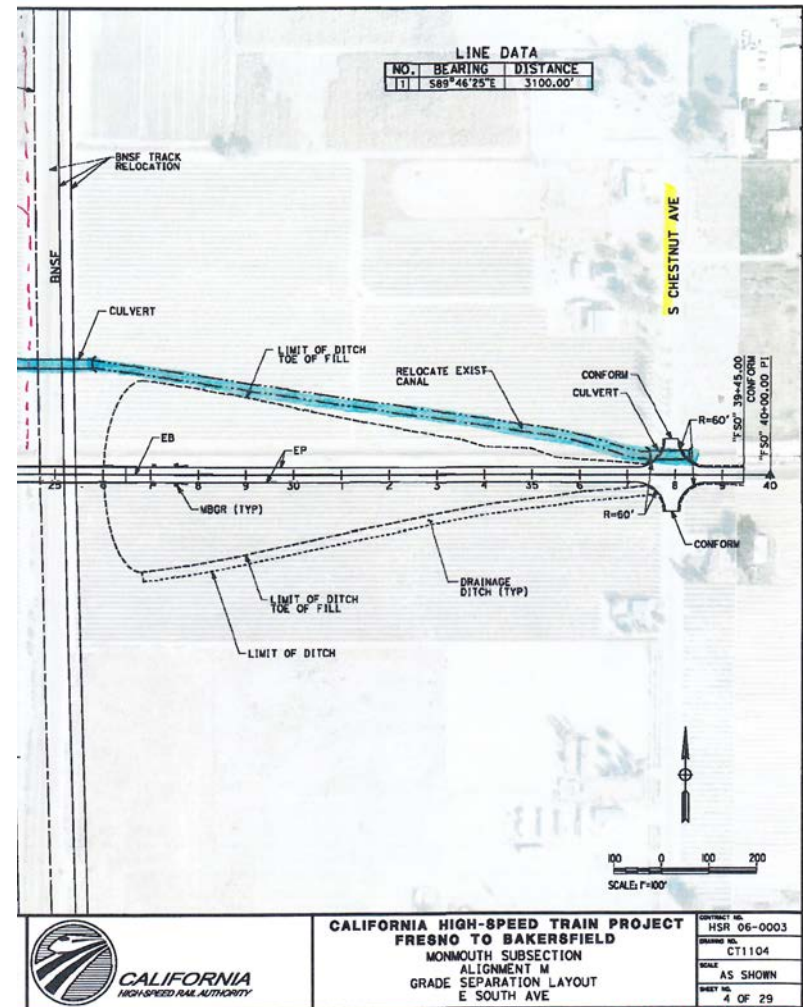
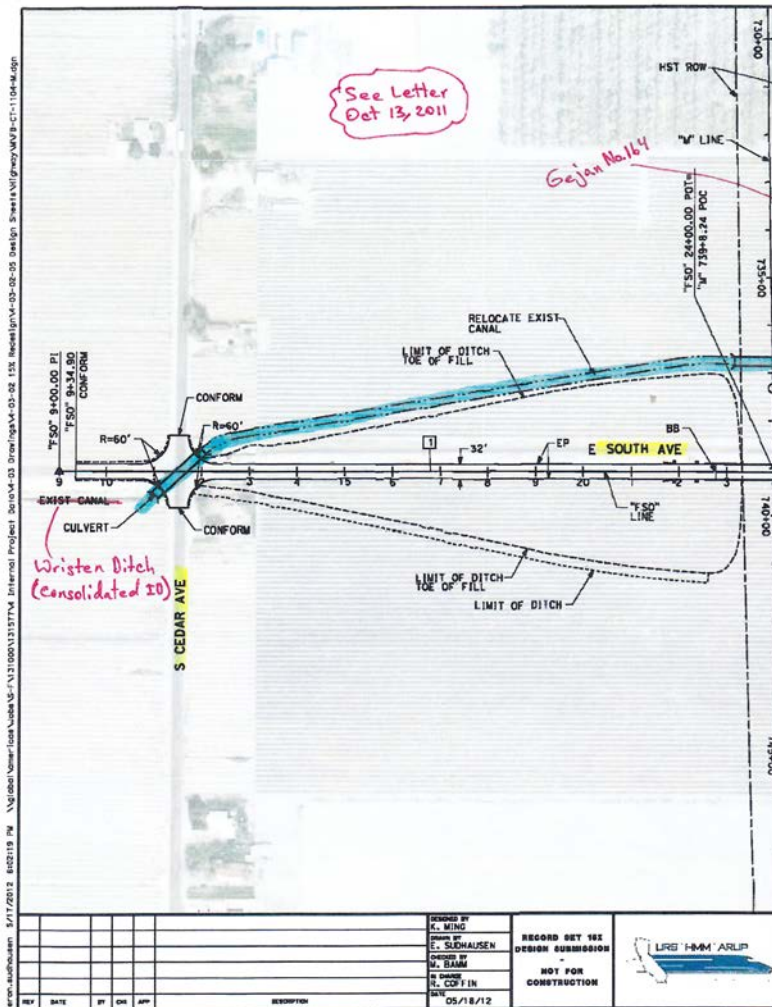
Submission L021 (William Stretch, Fresno Irrigation District, October 19, 2012) - Continued







CALIFORNIA  
High-Speed Rail Authority



Submission L021 (William Stretch, Fresno Irrigation District, October 19, 2012) - Continued



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Response to Submission L021 (William Stretch, Fresno Irrigation District, October 19, 2012)

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**L021-1**

Refer to Standard Response FB-Response-PU&E-03, FB-Response-HWR-01.

Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012)



**GREATER BAKERSFIELD SEPARATION OF GRADE DISTRICT**  
1800 30<sup>TH</sup> STREET, SUITE 260  
BAKERSFIELD, CA 93301  
(661) 327-1969

October 18, 2012

Mr. Jeff Morales  
California High-Speed Rail Authority  
Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment  
770 L Street, Suite 800  
Sacramento, California 95814

Subject: Comments Regarding the Fresno to Bakersfield High-Speed Train Revised  
Draft EIR/Supplemental Draft EIS

Dear Mr. Morales,

Thank you for the opportunity to review and comment on the Revised Draft EIR/Supplemental Draft EIS (DEIR) for the Fresno to Bakersfield section of the high-speed train (HST) system proposed by the California High-Speed Rail Authority (Authority). The Greater Bakersfield Separation of Grade District (District) is a special district surrounding the metropolitan Bakersfield area whose charge is to pursue and facilitate the elimination of at-grade railroad crossings through separation within the metro area. Over the past several years, the District has been working with the City of Bakersfield and County of Kern on plans and right of way reservation for separation of crossings of the BNSF Railway along the Santa Fe Way corridor between Hageman Road and Seventh Standard Road.

The HST has a significant impact to the existing and anticipated roadways which cross the BNSF Railway along the Santa Fe Way corridor. It also severely impacts the planned grade separations which the District and local agencies have been actively pursuing prior to HST. District staff and local agencies have had on-going coordination and meetings with Authority staff and consultants over the past two years. District staff has provided Authority staff with alignment and grade separation details for crossings at Renfro/Jenkins/Reina Roads, Kratzmeyer Road and the West Beltway.

L022-1

The current HST plans do not reflect the information which has been provided by the District and local agencies. HST plans show construction of limited rural/agricultural crossings of BNSF and HST at Renfro/Jenkins/Reina and Kratzmeyer Roads, and do not show a crossing for the West Beltway. These HST plans are not consistent with the requirements of the General Plan and anticipated growth and project timing represented in the current Regional Transportation Plan.

Authority staff requested and was provided additional information and justification for roadway improvements. This information was presented to Authority staff at a meeting jointly attended by staff from the City of Bakersfield, County of Kern, City of Shafter and the District on August 28, 2012.

L022-2

The following summary provides a general description of impacted transportation facilities within the subject Santa Fe Way corridor (see Figure 1) and describes improvements which must be constructed or otherwise provided for by the Authority in order to mitigate roadway and circulation impacts created by the HST and to comply with the Metropolitan Bakersfield General Plan and Circulation Element:

Santa Fe Way

Designated as an arterial: six lanes with concrete curb and gutter and a raised center median within 110 feet of right of way

Traffic conditions to 2035 warrant a minimum of four lanes; therefore, the Authority shall be responsible for the following:

- Obtaining 110 feet of replacement right of way from approximately 2,200 feet north of Hageman Road to Seventh Standard Road
- Relocating existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) that lie within the existing Santa Fe Way right of way to a location within the 110 feet of replacement right of way, or confirm alternate arrangements with facility owners
- Constructing a four-lane roadway with 12-foot travel lanes from approximately 2,200 feet north of Hageman Road to Seventh Standard Road
  - Use a minimum design speed of 65 mph

1 of 11

2 of 11

Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

L022-2

- Include a 14-foot raised center median with stamped concrete and concrete curbs to accommodate future expansion to the ultimate arterial standard
- Construct a paved shoulder and concrete curb and gutter on the east side
- Construct a paved shoulder and a bike lane on the west side
- Install fencing adjacent to the HST right of way
- Plant xeriscape landscaping on the east side
- Constructing 12-foot right-turn lanes with 120-foot bay tapers and 150-foot storage at the intersections of Kratzmeyer Road/Santa Fe Way connector road, realigned Reina Road, and Renfro Road/Santa Fe Way connector road
- Constructing 12-foot left-turn lanes with 120-foot bay tapers and 200-foot storage at the intersections of Kratzmeyer Road/Santa Fe Way connector road, realigned Reina Road, and Renfro Road/Santa Fe Way connector road
- Installing traffic signal systems at the intersections of Santa Fe Way and Kratzmeyer Road/Santa Fe Way connector road and Santa Fe Way and Renfro Road/Santa Fe Way connector road
- Installing traffic signal interconnect conduit and wiring between the traffic signal systems along Santa Fe Way from Galpin Road to Hageman Road

L022-3

Seventh Standard Road

Designated as an expressway: six lanes with concrete curb and gutter and a raised center median within 110 feet of right of way

Existing grade separation at BNSF Railway

The Authority shall be responsible for the following:

- Obtaining right of way necessary to extend the existing overcrossing to span BNSF, HST and Santa Fe Way rights of way
- Relocating existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the overcrossing extension

3 of 11

L022-3

- Reconstructing and extending the existing overcrossing
  - Use a minimum design speed of 60 mph
  - Install street lighting on bridge structure
  - Construct drainage facilities on bridge structure
  - Construct concrete curb, gutter and sidewalk
- Constructing roadway drainage facilities compatible with future adjacent development (i.e., sump rather than ditches)
- Planting xeriscape landscaping on slopes, parkways and medians
- Relocating/reconfiguring existing intersections which conflict with the overcrossing extension
  - Signalized intersection of Seventh Standard Road and Galpin Street
  - Access to property located south of Seventh Standard Road and east of BNSF Railway

L022-4

West Beltway

Future freeway: ultimate six lanes, near-term four lanes within 210 feet of right of way

The Authority shall be responsible for the following:

- Obtaining right of way necessary for a full-freeway-width grade separation spanning BNSF, HST and Santa Fe Way rights of way
  - Taper from 210 feet at touchdown points to approximately 320 feet at bridge abutments
  - Total structure length approximately 600 feet
- Relocating existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the grade separation
- Constructing grade separation structure to accommodate a six-lane freeway
  - Width of 96 feet between flow lines, a raised center median, concrete curb and gutter, and appropriate railing and fencing on both sides of the roadway structure
  - Use a minimum design speed of 65 mph for vertical curve design
  - Install street lighting on bridge structure

4 of 11

Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

L022-4

- Constructing grade separation embankment to a width adequate to accommodate a six-lane freeway
- Constructing four 12-foot lanes with shoulders from the bridge abutments to the touchdown points with a 32-foot center median
- Constructing roadway drainage facilities compatible with future adjacent development (i.e., sump rather than ditches)
- Planting xeriscape landscaping on slopes, parkways and medians

L022-5

Kratzmeyer Road

Designated as an arterial: six lanes with concrete curb and gutter and a raised center median within 110 feet of right of way

Planned grade separated crossing of BNSF Railway

Traffic conditions to 2035 warrant a minimum of six lanes; therefore, the Authority shall be responsible for the following:

- Obtaining right of way necessary for a full-arterial-width grade separation spanning BNSF, HST and Santa Fe Way rights of way
  - Taper from 110 feet at touchdown points to 310 feet at bridge abutments
  - Total structure length approximately 500 feet
- Relocating existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the grade separation
- Realigning existing canal
- Constructing grade separation structure to accommodate a full-width arterial street cross section
  - Width of 96 feet between flow lines, a raised center median (minimum four feet in width), concrete curb, gutter and sidewalk, and appropriate railing and fencing on both sides of the roadway structure
  - Use a minimum design speed of 65 mph for vertical curve design
  - Install street lighting on bridge structure
  - Construct concrete curb, gutter and sidewalk

5 of 11

L022-5

- Constructing grade separation embankment to a width adequate to accommodate a full-width arterial street
- Constructing six 12-foot lanes from the bridge abutments to the touchdown points, with a 14-foot raised center median
- Constructing roadway drainage facilities compatible with future adjacent development (i.e., sump rather than ditches)
- Providing bike lanes
- Planting xeriscape landscaping on slopes, parkways and medians
- Constructing an intersection with the Kratzmeyer Road/Santa Fe Way connector road and providing left- and right-turn channelization and installing a traffic signal system.

L022-6

Kratzmeyer Road/Santa Fe Way connector Road

The Authority shall construct a four-lane roadway within 90 feet of right of way to provide connectivity between Kratzmeyer Road and Santa Fe Way

- Use a design speed of 40 mph for horizontal curve design
- Provide left- and right-turn channelization at intersections

Approximate points of connection

- Kratzmeyer Road: 1,270 feet west of Santa Fe Way
- Santa Fe Way: 1,450 feet north of Kratzmeyer Road

Roadway length: 980 feet (approximate)

Roadway width: 68 feet

L022-7

Renfro Road/Jenkins Road

Designated as an arterial: six lanes with concrete curb and gutter and a raised center median within 110 feet of right of way

Planned grade separated crossing of BNSF Railway

Traffic conditions to 2035 warrant minimum of four lanes, standard arterial width is six lanes. Therefore, the Authority shall be responsible for the following:

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Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

L022-7

- Obtaining right of way necessary for a full-arterial-width grade separation spanning BNSF, HST and Santa Fe Way rights of way
  - Taper from 110 feet at touchdown points to 310 feet at bridge abutments
  - Total structure length approximately 350 feet
- Relocating existing utilities and similar facilities (e.g., gas, water, sewer, oil, fiber optic and electrical) which conflict with the grade separation
- Relocating the existing North Kern Water Storage District canal and sump
- Constructing grade separation structure to accommodate a full-width arterial street cross section
  - Distance of 96 feet between flow lines, a raised center median (minimum four feet in width), concrete curb, gutter and sidewalk, and appropriate railing and fencing on both sides of the roadway structure
  - Use a minimum design speed of 65 mph for vertical curve design
  - Install street lighting on bridge structure
  - Construct concrete curb, gutter and sidewalk
- Constructing grade separation embankment to a width adequate to accommodate a full-width arterial street
- Constructing six 12-foot lanes from the bridge abutments to the touchdown points, with a 14-foot raised center median
- Providing bike lanes
- Planting xeriscape landscaping on slopes, parkways and medians
- Constructing an intersection with the Renfro Road/Santa Fe Way connector road and providing left- and right-turn channelization and installing a traffic signal system.

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L022-8

Renfro Road/Santa Fe Way connector road

The Authority shall construct a two-lane roadway within 60 feet of right of way to provide connectivity between Renfro Road and Santa Fe Way

- Use a design speed of 40 mph for horizontal curve design
- Provide left- and right-turn channelization at intersections

Approximate points of connection

- Renfro Road: 1,180 feet west of Santa Fe Way
- Santa Fe Way: 1,120 feet north of Renfro Road

Roadway length: 1,800 feet (approximate)

Roadway width: 40 feet

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Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued



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L022-9

In addition to the impacts to the transportation facilities, the HST implementation and required mitigation noted above will result in corresponding adjustments in the land use boundaries and roadway alignments shown in the currently approved Metropolitan Bakersfield General Plan, Circulation Element and related master development plans approved by the city and county. Adjustment of these planning documents is required by state law and/or local ordinance to incorporate the HST system and related revisions which were not previously part of the approved documents. The adjustment of the planning documents is a required mitigation. Therefore, the Authority shall be responsible for all administrative costs incurred by the local agencies and property owners associated with adjustment in approved master plans, circulation elements, land use and zoning designations necessary to accommodate the HST. In addition, the Authority shall work in cooperation with both the local agencies and property owners to achieve the necessary adjustments.

L022-10

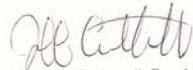
The comments above provide a general summary of the impacts and necessary mitigation within the subject Santa Fe Way corridor which is the primary focus of these comments. Fulfillment of the mitigation to the transportation facilities and provisions for the adjustment of planning documents, all as generally noted above, would substantially mitigate the concerns of the District. We look forward to the Authority's affirmative response to these concerns and agreement to the noted mitigation. We welcome the opportunity to coordinate further details with the Authority to assure appropriate revisions to the HST plans to verify the required mitigation.

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Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

Attached are two discussion summaries (Attachment No. 1: Traffic Circulation in Northwest Metropolitan Bakersfield, and Attachment No. 2: Technical Transportation Comments) to provide additional background and justification for our concerns and generally note technical inconsistencies, errors or omissions of the DEIR related to transportation and land use.

Sincerely,



Jeffrey B. Cutherell, President  
Greater Bakersfield Separation of Grade District

Cc: Public Works Department, City of Bakersfield  
Roads Department, County of Kern  
Kern Council of Governments

Attachments: Attachment No. 1  
Attachment No. 2

11 of 11

Attachment No. 1  
Greater Bakersfield Separation of Grade District  
Comments to the Fresno to Bakersfield  
Revised Draft EIR/Supplemental Draft EIS

**TRAFFIC CIRCULATION IN NORTHWEST METROPOLITAN BAKERSFIELD  
A HISTORY OF PHYSICAL BARRIERS AND DISCONTINUITY**

The city of Bakersfield is situated near the southern end of the San Joaquin Valley in Kern County, California. It is located generally midway between the cities of Fresno and Los Angeles which lie approximately 100 miles to the north and south, respectively. Bakersfield has a diverse economy which includes a burgeoning manufacturing and distribution sector in addition to its two primary industries of oil and agriculture.

Bakersfield is the ninth largest city in California with a current population of nearly 350,000 with more than 450,000 in the greater metropolitan area. Bakersfield is also one of the fastest growing cities in the state, having undergone a 400 percent increase in population over the 40-year period between 1970 and 2010.

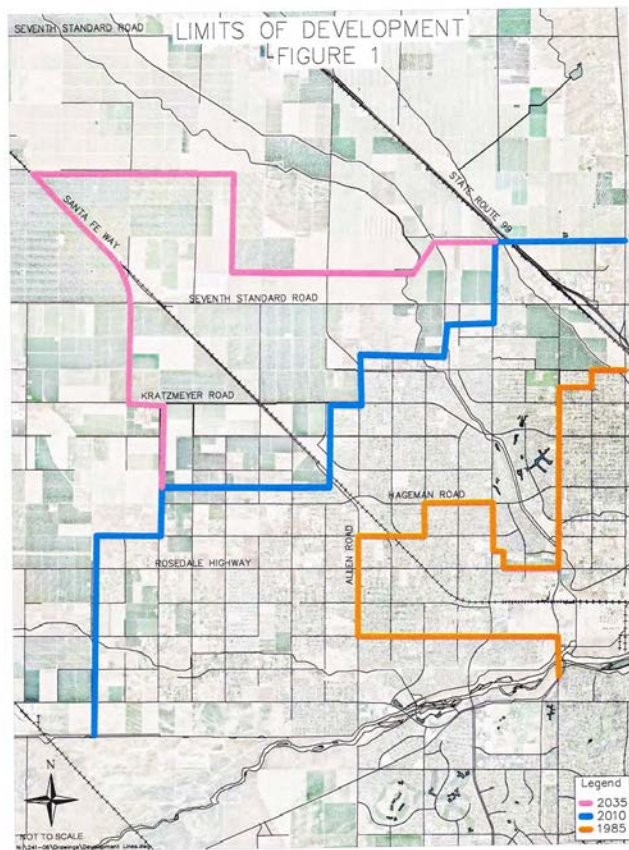
Growth and Development

Much of the city's growth in recent years has taken place in northwestern metropolitan Bakersfield, an area generally bounded by Seventh Standard Road on the north, Stockdale Highway on the south, State Route 99 on the east and Nord Road on the west. Since 1985, the limits of development have extended westward from Coffee Road to Renfro Road and northward from Hageman Road to Snow Road (see Figure 1).

Growth in northwestern metropolitan Bakersfield is expected to continue into the foreseeable future as the city expands further to the west. A number of development projects planned for this area have already been approved and include residential, commercial, mixed-use and industrial land uses (see Figure 2). It is anticipated that these developments would be completed by the year 2035 and could generate as many as 350,000 daily trips.

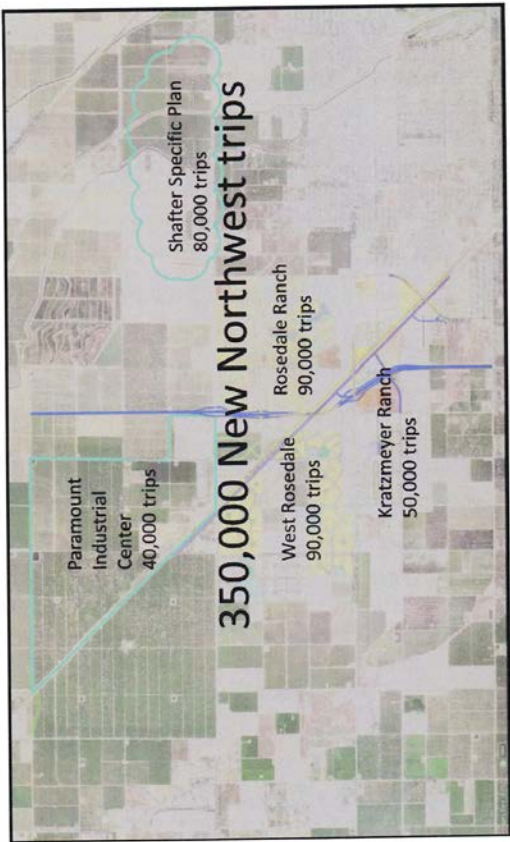
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Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued



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Anticipated Development and Trip Generation  
Figure 2



Attachment No. 1  
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Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

Existing and Future Street Systems

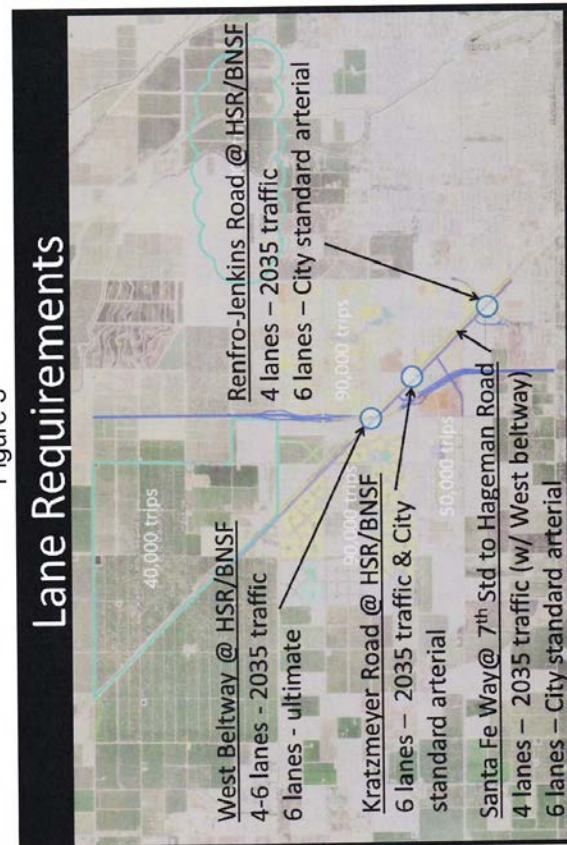
The street system in northwest metropolitan Bakersfield has been generally developed in a grid pattern of north-south and east-west arterial streets spaced at one-mile intervals. Many of the arterial streets located at or near the northwest city limit extend through areas which are currently agricultural and operate as either two- or four-lane roadways with graded shoulders. As development of approved urban land uses occurs, these roadways will be widened and improved to the full arterial standard of six lanes with concrete curb and gutter and a raised center median within 110 feet of right of way.

Development planned for northwestern metropolitan Bakersfield has been approved by the city of Bakersfield and county of Kern, as provided for in their adopted General Plans and Circulation Elements, as required by state law. The Metropolitan Bakersfield General Plan Circulation Element depicts full-width multilane arterials and freeways for this area. These facilities must be implemented in order to provide appropriate traffic circulation, safety, reasonable air quality and related service and protection to the public.

In addition to widening existing designated arterials in northwest Bakersfield from interim two-lane roadways to four- or six-lane facilities, the West Beltway is also an important component of the Circulation Element and will be needed to accommodate development approved in the adopted city and county General Plans (see Figure 3). The timely implementation of the West Beltway and the arterial corridors for Kratzmeyer Road and Renfro Road and the planned railroad grade separations of all three, in conjunction with the Seventh Standard Road grade separation, are interdependent and necessary to adequately accommodate public travel demand, safety and air quality.

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Figure 3



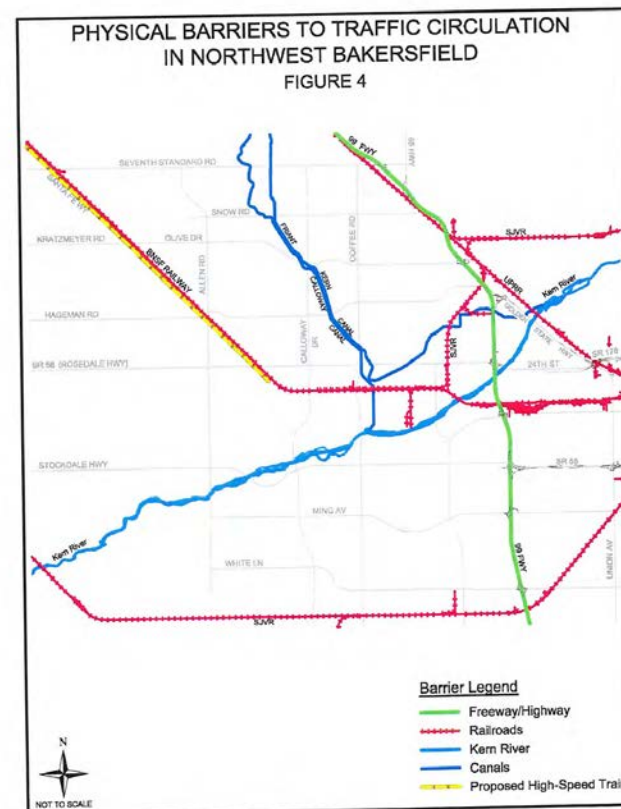
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Page 5 of 9

Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

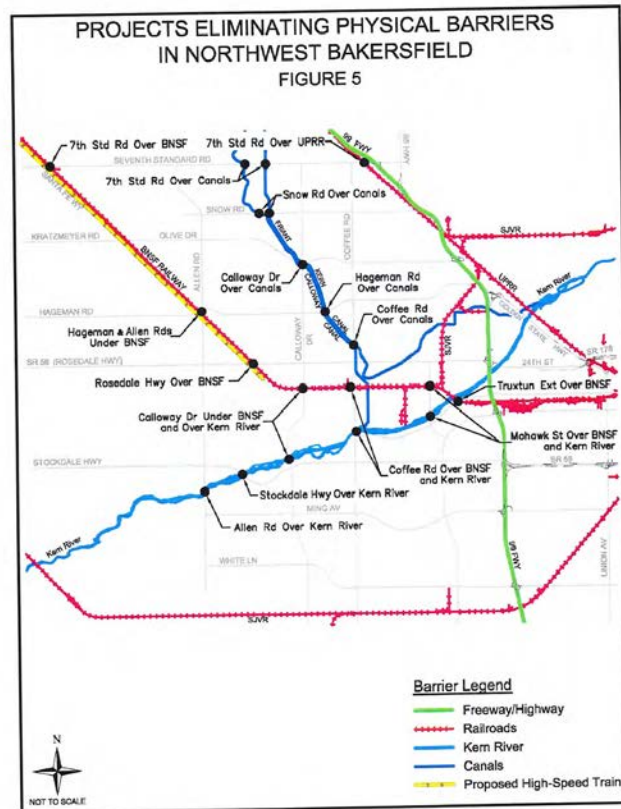
Longstanding Impediments to Traffic Circulation

Physical barriers which disrupt the continuity of the arterial grid system are the single greatest impediment to traffic circulation in northwestern metropolitan Bakersfield. These barriers consist of the Kern River and various manmade impediments, including BNSF Railway and the Union Pacific Railroad, the State Route 99 freeway and numerous canals, including the Friant-Kern Canal (see Figure 4). The railroads brought the first of the manmade barriers to the area more than 100 years ago when tracks were laid between the time Bakersfield was settled in 1858 and officially incorporated in 1898.

Over the past 30 years, the city and county have invested in a number of transportation improvement projects to mitigate the impacts of physical barriers on traffic circulation in northwestern metropolitan Bakersfield (see Figure 5). The total cost of these improvements amounts to approximately \$300 million in current dollars and includes railroad grade separations and river and canal crossings. These projects not only served to eliminate discontinuities in the existing arterial grid system, but were also built to full arterial standards in order to accommodate anticipated future travel demands.



Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued



Attachment No. 1  
Page 8 of 9

New Impediment and Impacts Created by High-Speed Rail

The California High-Speed Rail Authority (Authority) proposes to construct, operate and maintain an electric-powered high-speed train (HST) system which will connect the cities of San Francisco and Sacramento to the cities of Los Angeles and San Diego through the state's San Joaquin Valley. This statewide HST project is currently engaged in the environmental review process.

As currently planned, the HST system would be implemented in two phases. A single continuous section between the cities of Fresno and Bakersfield would be completed as part of the first phase. The planning horizon for completing the Fresno to Bakersfield section is the year 2035.

The preferred alignment for the HST section between Fresno and Bakersfield lies generally along the BNSF Railway. As currently planned, the preferred BNSF alignment would be at-grade through northwestern metropolitan Bakersfield, thereby creating an additional manmade barrier which would disrupt the continuity of the existing arterial grid system and impede traffic circulation. While the HST has been determined by many to be a necessary part of the future state-wide transportation system, its implementation must not create new, unforeseen and unmitigated restrictions and/or additional local obligations and costs.

As required by state law, the local governmental agencies have adopted General Plans and Circulation Elements indicating land use and supporting transportation systems which balance growth, economic viability, public demand and public safety among other issues. In accordance with state laws and local ordinances, private land owners plan future land uses and agree to designated mitigation provisions, all as approved by governmental agencies and as described in the General Plans and Circulation Elements. The proposed HST must acknowledge and mitigate its impacts to the currently adopted governmental plans and the private land owner uses and rights as described therein.

Attachment No. 1  
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Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

Attachment No. 2  
Greater Bakersfield Separation of Grade District  
Comments to the Fresno to Bakersfield  
Revised Draft DIR/Supplemental Draft EIS

TECHNICAL TRANSPORTATION COMMENTS  
DEFICIENCIES, INCONSISTENCIES AND NOTES

L022-11

SECTION 3.2 TRANSPORTATION

Section 3.2.2 Laws, Regulations, and Orders

Section 3.2.2.2 State notes that Gov Code 65080 requires a transportation planning agency to prepare and adopt a regional transportation plan (RTP); however, it fails to note the Gov Code 65300 requires, among other items, that the legislative body of each county and city shall adopt a comprehensive, long-term general plan (GP); and, that Section 65302 requires that the GP include, among other items, a land use element [65302(a)], and a circulation element [65302(b)]. The circulation element shall include, among other items, existing and proposed major thoroughfares, transportation routes . . . and other public facilities . . . all correlated with the land use element of the plan.

Section 3.2.2.3 Regional and Local includes acknowledgement of local plans and policies and notes the Kern County GP (2009) and the Metropolitan Bakersfield GP, but, the DEIR analysis and mitigation measures fail to address the impacts of the project on the Circulation Element of the GP and all the related impacts to other elements of the GP and future safety, capacity and air quality effects on the transportation system designated in the Circulation Element.

L022-12

Section 3.2.3 Methods for Evaluating Impacts

Section 3.2.3.5 CEQA Significance Criteria; Operational Phase;

The DEIR indicates:

"The project would also have a significant effect on the environment if it would do any of the following:

L022-12

- Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.
- Result in inadequate emergency access.
- Substantially increase hazards due to a design feature (such as sharp curves or dangerous intersections) or from incompatible uses (such as farm equipment)."(sic)

The DEIR and project design does not adequately address the arterial corridors shown in the Circulation Element and acknowledge that such corridors would likely be developed to ultimate multiple-lane configurations with bicycle and pedestrian facilities and expanded intersections with turn lanes in the year 2035 when HST is operational. The lack of such ultimate arterial facilities and the proposed reduction of design speeds shown in the project design would not be consistent with adopted policies, plans and would substantially increase hazards.

L022-13

Section 3.2.4 Affected Environment

The DEIR indicates: "This section describes the affected environment related to transportation." However, the DEIR basically limits analysis of impacts to the traffic around HST stations and essentially ignores the impacts on other portions of the Circulation Element.

L022-14

Section 3.2.4.1 Regional Transportation System indicates in part: "The following subsections summarize the transportation network and facilities in the Fresno to Bakersfield Section."

Highways and Roadways

"The region contains several routes as well as other regionally significant roadways that serve as connections to population centers outside of the Fresno to Bakersfield Corridor. Figures 3.2-1 through 3.2-5 illustrate state routes and other regionally important roadways in this corridor."

The above is the quote of the entire subsection related to Highways and Roadways. Further, Figure 3.2-5 claims to represent regionally significant roads but essentially fails to show many of the arterials described in the Circulation Element. Additionally, for the roadways that are shown (such as Santa Fe Way, Kratzmeyer Road, Seventh

Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

L022-14

Standard Road) the project design fails to acknowledge or provide for the arterial corridor consistent with the adopted Circulation Element or what would be in place in the year 2035. Likewise, other roadways described in the Circulation Element, but not acknowledged as "regionally significant" by the DEIR, are not adequately addressed by the DEIR or the project design.

L022-15

### 3.2.5.3 High-Speed Train Alternatives

#### Consistency with Regional Plans and Policies

The DEIR indicates in part that: "The HST project is generally consistent with the plans and policies in Table 3.2-1." This table includes Kern County GP (2009) and the Metropolitan Bakersfield GP; however, the DEIR and the project design does not adequately acknowledge or provide for any of the highway facilities consistent with the GP Circulation Element.

L022-16

#### Project Impacts

##### *Impact TR # 10 – Impacts on Regional Transportation System*

The DEIR indicates in part that: "The HST alternates would provide benefits to the regional transportation system by reducing trips, etc." Again, the DEIR analysis and mitigation measures fail to address the impacts of the project on the Circulation Element of the GP, and all the related impacts to other elements of the GP, and the future safety, capacity and air quality effects on the transportation system designated by the Circulation Element.

L022-17

### 3.2.7 Mitigation Measures

#### TR MM#6 Widen Approaches to Intersections

#### TR MM#7 Add Exclusive Turn Lanes to Intersections

#### TR MM#8 Add New Lanes to Roadway

The DEIR indicates the above mitigation measures basically to maintain or improve LOS and traffic operations; however, the DEIR analysis and project design are

L022-17

inconsistent with the GP Circulation Element adopted by the County of Kern and the City of Bakersfield as required by State law.

L022-18

### SECTION 3.11 SAFETY AND SECURITY

#### 3.11.3.2 CEQA Significance Criteria

The DEIR indicates in part:

"CEQA requires the analysis of impacts to determine whether significant impacts would occur as a result of the proposed alternatives and the identification of specific mitigation for significant impacts. A significant safety or security impact would occur if a project were to do one or more of the following:

- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the safety of such facilities.
- Substantially increase hazards due to a design feature (e. g., sharp curves or dangerous intersections) or incompatible uses.
- . . . Airport land use . . .
- . . . Government facilities . . . service ratios . . .
- Result in inadequate emergency access.
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan."

The DEIR and project design fail to acknowledge and consider the Circulation Element of the GP and the other related elements of the GP which are based on all the arterial facilities designed in the Circulation Element. The lack or reduced capacity and serviceability of arterial corridors as proposed in the project design would directly impact safety and security, emergency access and adopted emergency response and/or emergency evacuation plans based on the currently adopted General Plan elements thereof.

Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

L022-19

**3.11.3.3 Study Area**

The third paragraph of this section indicates: "When the HST track is adjacent to a highway or roadway, a barrier is typically required where the roadway is less than 30 to 40 feet from the HST access control fence. Depending on the highway facility, the barrier can range from a standard concrete barrier to a taller barrier that protects against errant commercial trucks or trailers. Where the separation is greater than 30 to 40 feet, barriers may be considered, subject to a risk assessment."

The DEIR and project design does not provide adequate future roadway width consistent with the above provisions and Circulation Element. As proposed, some roadways (e.g., Santa Fe Way) would be extremely difficult to widen as designated by the Circulation Element and/or would have substantial additional costs added to the future road widening which is not being adequately address by the project. Additionally, future risk assessments may find that increased separation width might be required which may further encumber the parallel roadways (e.g., Santa Fe Way). The DEIR and project should acknowledge and provide for all potential risk assessment concerns and/or the HST system should assume any future obligations related to future modification needs or improvements.

L022-20

**3.11.8 NEPA Impacts Summary**

The DEIR indicates in part, under the HST alternatives, the effects are summarized. The third summarized effect states:

"The HST alignment would have no effect on motor vehicle, pedestrian, and bicycle safety due to full grade separation and roadway improvements. Because the project involves replacement of at-grade crossings over existing railroad lines, the change of safety for the local communities would have a beneficial effect under NEPA."

Under the current project design and lack of acknowledgement of the Circulation Element of the GP, and all the related elements of the GP, this assertion is grossly in error. The HST system as currently designed will, in fact, encumber and restrict the roadways and transportation improvements designated by the Circulation Element; and, not allow or substantially reduce the capacity, safety and air quality of the transportation facilities which are currently planned and which would otherwise likely be implemented in the 2035 year when the HST is operational.

Attachment No. 2  
Page 5 of 7

L022-21

**3.11.9 CEQA Significance Conclusions**

The DEIR indicates only one impact and mitigation which relates to increased demand for fire, rescue, and emergency services at the stations and HMF (heavy equipment facilities), with a mitigation measure involving monitoring response of local fire and rescue and emergency services to the stations and HMF. The DEIR states that "After mitigation, no impacts related to safety and security would be significant under CEQA."

Similar to the NEPA Impact Summary, Section 3.11.8, this assertion is grossly in error.

L022-22

**3.18 Regional Growth**

**3.18.2.3 Regional and Local**

**Kern Council of Governments Destination 2030 Regional Transportation Plan**

The DEIR correctly acknowledges the following from the RTP:

**"Goal: Livability"**

**"Policy:** Support goals contained in city and county general plans that strive to enhance urban and community centers, promote the environmental sensitive use of land in Kern County, revitalize distressed areas, and ensure that new growth areas are planned in a well-balanced manner."

However, the DEIR analysis and project design are inconsistent with the GP Circulation Element adopted by the County of Kern and the City of Bakersfield as required by State law; and, fails to properly acknowledge the stated provisions and policy of the RTP.

L022-23

**3.18.2.4 Local**

The DEIR correctly acknowledges, among other items, that Kern County and cities of Shafter and Bakersfield all have adopted general plans. The DEIR states:

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L022-23

"General plans are required by California state law, and each includes seven mandatory elements (Circulation, Conservation, Housing, Land Use, Noise, Open Space, and Safety and Seismic Safety) and must contain text that describes the goals, objectives, and policies for development. The general plans and their goals, objectives, and policies are guiding documents for the long-range growth, development, and redevelopment. These local plans and policies were considered in the preparation of this analysis."

However, the DEIR analysis and project design are inconsistent with the GP Circulation Element adopted by the County of Kern and the City of Bakersfield as required by State law; and fail to properly acknowledge the stated provisions and policy which the DEIR purports were considered. At a minimum, if these local plans and policies were considered but not provided for (such as reduced roadway widths, reduce design speeds and decreased capacity, safety and air quality) then extensive analysis, mitigation and/or overriding considerations would be required for any non-compliance with the adopted general plans and all elements thereof.

L022-24

### 3.18.4 Affected Environment

The second paragraph under this section acknowledges that Bakersfield is the next largest city in the study area (after Fresno) and that is growing at a faster rate than Fresno (See Table 3.18.1).

#### 3.18.4.1 Population

The DEIR notes that over the next 25 years (2010 to 2035) the population of Kern County is projected to grow 81%, the fastest within the study area.

Accommodation of this stated growth, which is anticipated to be in place by the time the HST is operational, should be reflected in the project design by acknowledging and providing for all transportation facilities shown in the Circulation Element. The project design should not propose any reductions in design features (width, speed, sight distance, traffic channelization, bicycle and pedestrian uses, or others) which would restrict the full anticipated implementation of the general plans and should not result in any reduction of transportation capacity, safety or air quality.

From: (661) 327-1969 Brenda Campbell RUETTIGERS & SCHULER 1800 30th Street Suite 260 BAKERSFIELD, CA 93301	Origin ID: BFLA	FedEx Express	Ship Date: 18OCT12 ActWgt: 0.5 LB CAD: 4159877ANET3300
SHIP TO: (661) 327-1969 Mr. Jeff Morales California High Speed Rail Authorit 770 L ST STE 800 SACRAMENTO, CA 95814		BILL SENDER	Delivery Address Bar Code 
		Ref # 112-01 Invoice # PO # Dept #	RECEIVED 10/19/2012
		TRK# 7982 2945 1939 6291	FRI - 19 OCT A2 STANDARD OVERNIGHT
		WD BLUA	95814 CA-US SMF
			

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Page 7 of 7

## Response to Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012)

### L022-1

Refer to Standard Response FB-Response-GENERAL-08.

As stated in the Chapter 2, Appendix A, Road Crossings, of the Final EIR/EIS, Renfro Road would pass over the HST, BNSF and Santa Fe Way; however, Reina Road would be closed. Kratzmeyer Road would pass over the HST, BNSF, and Santa Fe Way. A new connector would connect Kratzmeyer Road and Santa Fe Way west of the HST. The West Beltway route has been adopted, although funding of the project has not been identified to date. Assuming the HST project is in place, it will not preclude the Beltway from crossing the Santa Fe corridor via a grade-separated overcrossing. The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project. The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The citywide circulation network is not part of the HST's scope of analysis; rather the EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and crossings of existing roadways and necessary roadway closures.

### L022-2

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-3

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-4

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-5

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-6

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-7

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-8

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

## Response to Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

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### **L022-9**

The comment is correct in noting that adjustment will be required to update planning documents to incorporate the HST System's impact on master plans, circulation elements, and land use and zoning designations. However, this is not a required mitigation and State law does not require that planning documents be updated immediately to reflect all changes in areas covered by the documents. Therefore, these changes could be reflected in amendments that typically occur over time, and updates that would incorporate the project changes would be reflected with scheduled updates of these planning documents.

The Authority will coordinate with all jurisdictions to provide information to prepare these amendments and achieve the necessary adjustments.

### **L022-10**

Refer to Master Response FB-Response-8

The Authority will continue to coordinate with the District regarding mitigation measures along the Santa Fe corridor.

### **L022-11**

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and crossings of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS.

### **L022-12**

As previously discussed, the local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and crossings of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS.

### **L022-13**

As previously discussed, the local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and crossings of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS.

### **L022-14**

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The citywide circulation network is not part of the HST's scope of analysis; rather the EIR/EIS considered the impacts of the project on the existing and planned transportation

## Response to Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

### **L022-14**

network, including the impact of traffic at station areas on local intersections, and crossings of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS. The HST stations will not impact the circulation networks of the entire city they are located in, and therefore traffic analysis addresses impacts located within the defined station study areas.

### **L022-15**

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The citywide circulation network is not part of the HST's scope of analysis; rather the EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at station areas on local intersections, and crossings of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS. The HST stations will not affect the circulation networks of the entire city they are located in, and therefore traffic analysis addresses impacts located within the defined station study areas.

### **L022-16**

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The citywide circulation network is not part of the HST's scope of analysis, rather the EIR/EIS considered the impacts of the project on the existing and planned transportation

### **L022-16**

network, including the impact of traffic at station areas on local intersections, and crossings of existing roadways and necessary roadway closures. Levels of service and intersection delays were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS. The HST stations will not impact the circulation networks of the entire city they are located in, and therefore traffic analysis addresses impacts located within the defined station study areas.

### **L022-17**

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and the crossing of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS.

As noted above, the recommendations for widening approaches to intersections (which provide more queuing of vehicles waiting to turn, to minimize interference with through lanes), adding exclusive turn lanes (to also minimize interference of vehicles waiting to turn with through traffic lanes), and adding new lanes to roadways all have the potential to reduce delays and improve levels of service. These categories of traffic improvements are called out in the general plans, with the intent that future planning can accommodate these changes if needed in the future. This comment does not refer to any specific traffic

## Response to Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

### L022-17

mitigation measures or locations that are inconsistent. Any changes to roadways or intersections would remain under the jurisdiction of the local city or county. For these reasons, the development and implementation of these mitigation measures would not be inconsistent with the general plans' circulation or transportation elements.

### L022-18

Refer to Standard Response FB-Response-TR-02, FB-Response-S&S-01.

Permanent road closures are listed in Appendix 2-A of the EIR/EIS. The impacts of those closures on safety are described in 3.11 of the EIR/EIS.

### L022-19

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will continue coordination with the Greater Bakersfield Separation of Grade District and other local agencies on the required level of roadway improvements associated with the HST project.

### L022-20

The local General Plan policies and goals establish the framework for the development of the transportation network, with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, the crossing of existing roadways, and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts.

The mitigation measures identified are consistent with General Plan goals such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lane widths that meet local standards). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS. The project design and EIR/EIS took into account all roadway improvements planned to

### L022-20

2035 contained in the constrained Regional Transportation Plans for the counties crossed by the project. These are roadway improvements with a reasonable degree of certainty of being implemented by 2035 and are the improvements each county uses to assess future environmental conditions associated with transportation. The project does not encumber or restrict the roadway system in any county crossed by the HST System. In many cases, by providing grade separations at existing roadway crossings of the BNSF Railway tracks, the project will improve safety and security and traffic circulation in the counties.

### L022-21

Refer to Standard Response FB-Response-S&S-04.

### L022-22

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and crossing of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified are consistent with General Plan goals, such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lane widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS.

### L022-23

The local General Plan policies and goals establish the framework for the development of the transportation network with a wide range of policies affecting transportation. The EIR/EIS considered the impacts of the project on the existing and planned transportation network, including the impact of traffic at stations on local intersections, and crossing of existing roadways and necessary roadway closures. Levels of service and intersection delay were considered with regard to any impacts. The mitigation measures identified

## Response to Submission L022 (Jeffrey Cutherell, Greater Bakersfield Separation of Grade District, October 19, 2012) - Continued

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### **L022-23**

are consistent with General Plan goals such as the addition of turn lanes and signal improvements at intersections that function poorly. Where improvements are made, they will meet local design requirements to the extent feasible (e.g., allowance for shoulders on new overcrossings, lanes widths that meet local standards, etc.). The project will not reduce roadway widths or design speeds, with the exception of where roadway closures are planned, as identified in the EIR/EIS.

### **L022-24**

Refer to Standard Response FB-Response-TR-02, FB-Response-LU-02, FB-Response-LU-03, FB-Response-LU-04.

As described in Section 3.2, Transportation, the BNSF Alternative would close four roads at the HST right-of-way in rural Kings County: 9th, North, Douglas, and Lansing avenues. The Hanford West Bypass 1 and 2 alternatives would close two roads at the HST right-of-way in rural Kings County: Elder and S. 10th avenues. These closures would not result in out-of-direction travel of more than approximately 1 mile. Although these closures may not be consistent with the Circulation Element, the small amount of out-of-direction travel is considered to be an effect of moderate intensity under NEPA and the impact would be less than significant under CEQA. The project would not reduce any other design features for transportation facilities in Kings County as they are enumerated in the Kings County 2035 Circulation Element.

In the long term, the HST System would help improve air quality in the San Joaquin Valley air basin by reducing vehicle miles traveled (VMT) in comparison with the No Project Alternative. Automobiles produce a major portion of the air pollutants generated within the air basin, and reducing VMT reduces these emissions. Over the long term (year 2035), the HST project would result in smaller increases in motor vehicle emissions than would occur with the No Project Alternative, and these reductions, along with the Voluntary Emissions Reduction Agreement between the Authority and the San Joaquin Valley Air Pollution Control District, would offset any short-term emission increases associated with the construction and long-term operation of the HST System itself (refer to Section 3.3.6, Environmental Consequences, of the Revised DEIR/Supplemental DEIS).

Submission L023 (Cheryl Silva, Hanford Joint Union High School District, October 19, 2012)



**Fresno to Bakersfield High-Speed Train Section**  
Revised Draft Environmental Impact Report/  
Supplemental Draft Environmental Impact Statement  
(Revised Draft EIR/Supplemental Draft EIS)

**La Sección de Fresno a Bakersfield del Tren de Alta Velocidad**  
Proyecto Revisado de Informe de Impacto Ambiental/  
Declaración de Impacto Ambiental Proyecto Suplementario  
(Proyecto Revisado EIR/Proyecto Suplementario EIS)

Please submit your completed comment card at the  
end of the meeting, or mail to:  
**Fresno to Bakersfield Revised Draft EIR/Supplemental Draft EIS Comment, 770 L Street, Suite 800, Sacramento, CA 95814**

Por favor entregue su tarjeta completada al final de la  
reunión, o envíela por correo a la siguiente dirección:

The 20	Extended comment period for Fresno to Bakersfield High Speed Train Revised Draft EIR/Supplemental Draft EIS: July 20 – October 19	ber 20, ically, or 0, 2012.	El per de Se recibi del 20	Extendido el periodo de comentario público del Proyecto Revisado EIR/Proyecto Suplementario EIS Julio 20 – Octubre 19	20 n que ser o antes
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E-mail Address/Correo Electrónico: chsilva@hjuhsd.k12.ca.us  
(Use additional pages if needed/Usar paginas adicionales si es necesario)

- L023-1 1. Through the City of Hanford the HSR bypasses BNSF on both EAST and WEST options. Will HSR grade separate BNSF in order for the City to benefit as if the HSR followed the BNSF tracks?
- L023-2 2. Will HSR coordinate with City of Hanford/County of Kings regarding future general plan build out incorporating widening of roads and lane expansion in planning grade separation of HSR?
- L023-3 3. What noise mitigation measures will be taken to decrease dBA at Sierra Pacific High School to not disrupt learning 4 times per hour? The anticipated increase is projected at 7-9 dBA!
- L023-4 4. IF HSR goes through Hanford... why not agree to a station (since the argument of not going to IS is to increase ridership!)?

## Response to Submission L023 (Cheryl Silva, Hanford Joint Union High School District, October 19, 2012)

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### **L023-1**

A safely operating HST System would consist of a fully grade-separated and access-controlled guideway. Unlike existing passenger and freight trains in the project area, there would be no at-grade road crossings. Nor would the HST System share its rails with freight trains. The Authority would neither modify facilities unrelated to the HST project nor maintain any facilities outside of the project right-of-way.

### **L023-2**

Refer to Standard Response FB-Response-GENERAL-08.

The Authority will consult with agencies regarding grade separation projects; however, it is assumed that roadways would be replaced in-kind unless widening projects are included in local and regional plans and funding.

### **L023-3**

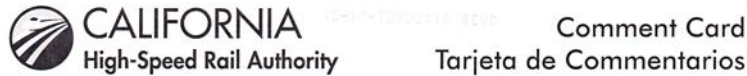
Refer to Standard Response FB-Response-N&V-02, FB-Response-N&V-05.

The Authority will take steps to reduce noise substantially through mitigation measures that are reasonable, physically feasible, practical, and cost-effective. In the report, sound insulation is identified as an alternative mitigation measure if sound barriers are not constructed and residences may be severely impacted by noise.

### **L023-4**

The Kings/Tulare Regional Station is no longer considered a "potential" station. The Authority and FRA will construct a Kings/Tulare Regional Station in the vicinity of Hanford as part of the project. Construction timing would be based on ridership demand in the region, and would occur during Phase 2 of the statewide project, sometime after 2020.

Submission L024 (Edward A. Fernandes, Home Garden Community Services District, October 18, 2012)



**Fresno to Bakersfield High-Speed Train Section**  
Revised Draft Environmental Impact Report/  
Supplemental Draft Environmental Impact Statement  
(Revised Draft EIR/Supplemental Draft EIS)

**La Sección de Fresno a Bakersfield del Tren de Alta Velocidad**  
Proyecto Revisado de Informe de Impacto Ambiental/  
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Name/Nombre: Edward A. Fernandes  
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E-mail Address/Correo Electrónico: \_\_\_\_\_  
(Use additional pages if needed/Usar paginas adicionales si es necesario)

- L024-1 It will affect resident of Kings County on  
different ways. People will lose jobs,  
their properties. we are not against of the  
the fast rail, we don't like the way the  
that, whomever its doing this is  
hurting lots o people, families  
L024-2 we are bringing pollution and  
L024-3 also will kill our little creaturs like  
lizards, etc

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## Response to Submission L024 (Edward A. Fernandes, Home Garden Community Services District, October 18, 2012)

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### **L024-1**

Refer to Standard Response FB-Response-GENERAL-14, FB-Response-SO-01.

See the EIR/EIS, Volume I, Section 3.12, Impacts SO #9, SO #10, and SO #11, for the potential displacement and relocation of local residences and businesses. For information on new job creation and the resulting impacts on the regional economy, see Volume I, Section 3.12, Impacts SO #5 and SO #13. Also see Section 5.1.2 of the Community Impact Assessment Technical Report for more detailed information on short-term and long-term job creation.

### **L024-2**

Refer to Standard Response FB-Response-AQ-04.

As described in Section 3.3 of the EIR/EIS, the HST project will reduce the volume of criteria pollutant emissions in the San Joaquin Valley and reduce greenhouse gas emissions by reducing travel made by private passenger vehicles. Please see Section 3.7 of the EIR/EIS for a discussion of biological impacts associated with the project.

### **L024-3**

As described in Section 3.7.5.3 of the Revised DEIR/Supplemental DEIS, the project may result in impacts on wildlife species such as lizards. Mitigation for these impacts are presented in Section 3.7.7.2, including Mitigation Measures BIO-22 and BIO-23, which address preconstruction surveys for reptile species, as well as monitoring, avoidance, and relocation of these species during construction. Compensation for impacts on specific special-status reptile species in the form of habitat loss is presented in Section 3.7.7.3 under Mitigation Measure BIO-57. Additional information about impacts on wildlife species is presented in the Biological Resources and Wetlands Technical Report (Authority and FRA 2012g).

